NEXTGEN: AREA NAVIGATION (RNAV)/ REQUIRED NAVIGATION PERFORMANCE (RNP)

(111–55)

HEARING

BEFORE THE

SUBCOMMITTEE ON
AVIATION

OF THE

COMMITTEE ON
TRANSPORTATION AND
INFRASTRUCTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

JULY 29, 2009

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July 28, 2009

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Aviation

FROM: Subcommittee on Aviation Staff

SUBJECT: Hearing on "NextGen: Area Navigation (RNAV)/ Required Navigation Performance (RNP)"

PURPOSE OF HEARING

The Subcommittee on Aviation will meet on Wednesday, July 29, 2009, at 10:00 a.m., in room 2167 of the Rayburn House Office Building to receive testimony regarding NextGen: Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures.

BACKGROUND

The current national airspace system (NAS) consists of a network of en route[1] airways, much like an interstate highway grid in the sky, interconnected by, and dependant on, ground-based navigation facilities. These ground-based facilities emit directional signals that aircraft use to navigate through geographic points in the airspace. Limits on the transmission distances of these signals prevent aircraft from flying direct routes on long-distance flights, and limit the utilization of airspace to predefined routes where aircraft can reliably transition from one navigational signal to the next.

[1] The Federal Aviation Administration (FAA) uses three types of facilities to control traffic: *Airport towers* direct traffic to the ground before landing and after takeoff within 5 nautical miles of the airport and about 3,000 feet above the airport. *Terminal Radar Approach Control Facilities (TRACONs)* sequence and separate aircraft in terminal airspace – i.e., as they approach and leave airports, beginning about five nautical miles and ending about 50 nautical miles from the airport and generally up to 10,000 feet above the ground. *En route centers* control aircraft in high-altitude en route airspace – i.e., in transit and during approaches to some airports, generally controlling air space that extends above 18,000 feet for commercial aircraft.

In the terminal environment, near busy airports and metropolitan areas, aircraft follow arrival and departure routes by tracking ground-based navigational signals, much like navigation during the en route phase of flight, or by following the instructions of air traffic controllers, usually referred to as receiving radar vectors, that often require aircraft to fly, inefficient, zigzag-like patterns.

RNAV and RNP procedures rely on aircraft avionics for improved route precision. RNAV allows aircraft to fly any desired flight path without the limitations imposed by ground-based navigation systems. RNP is RNAV with the addition of an onboard monitoring and alerting capability for pilots that takes advantage of an aircraft's onboard navigation capability to fly more precise, efficient, and even curved paths into and out of airports.

RNAV and RNP procedures hold enormous potential to reduce aircraft fuel burn, noise and carbon emissions, boost controller productivity, and increase capacity. The Government Accountability Office (GAO) recently testified[2] that one stakeholder it interviewed reported that during a 12-month period, more than 8,000 RNP approaches at Brisbane, Australia, saved 34 Qantas 737-800 aircraft a total of 4,200 minutes of flying, 65,000 gallons of fuel, and 621 metric tons of carbon dioxide emissions. Average delays at the airport were reduced by 30 seconds for each arriving aircraft, which benefit from the fact that the RNP approaches take several miles off aircraft approach paths to the runway, compared with an existing visual approach. Since 2005, Alaska Airlines, an early RNP pioneer, has documented 5,300 flights that avoided diversions using RNP procedures. In 2008, avoiding these diversions saved the airline $8 million. The United Parcel Service, relying on Optimized Descent Profile[3] that uses RNP, uses these procedures at Louisville, Kentucky with reported savings of between 250 and 465 pounds of fuel (37-69 gallons) per arrival.

Both the FAA and industry stakeholders hold high expectations for RNAV and RNP procedures to provide near- to mid-term benefits. RNAV and RNP procedures are featured in the FAA's NextGen Implementation Plan (NGIP), and they are expected to be one major part of the RTCA NextGen Mid-Term Implementation Task Force final report that is due next month. These procedures have also been listed by the Department of Transportation Inspector General (DOT IG) as a key near-term capacity enhancing initiative.[4][5]

Yet, while RNAV/RNP procedures hold significant potential for near-term benefits, the FAA faces challenges implementing these procedures. For example, current RNAV/RNP routes are largely overlays of existing routes and have not required extensive environmental reviews. To maximize these benefits of RNAV/RNP, the FAA will need to review future airspace changes and

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[2] *GAO response to Chairman Costello question for the record (May 20, 2009): Hearing on the ATC Modernization and the Next Generation Air Transportation System: Near-Term Achievable Goals*, 111th Cong. (Mar. 18, 2009).

[3] Optimized Descent Profile is a general term for a broad class of aircraft descent routes and procedures that are designed to reduce fuel burn and emissions during descent by minimizing aircraft level offs and allowing an aircraft to maintain near-idle engines during descent.

[4] Department of Transportation Office of the Inspector General, *Observations on Short-Term Capacity Initiatives, Report Number: AV-2008-087* (Sept. 26, 2008).

[5] The recently introduced Senate FAA reauthorization bill (S. 1451, the "FAA Air Transportation and Safety Improvement Act"), includes provisions intended to accelerate the deployment of RNAV/RNP procedures. For example, section 314 of S. 1451 requires the FAA to develop a plan to deploy RNAV/RNP procedures at the top 35 airports by 2014, and throughout the entire NAS by 2018.

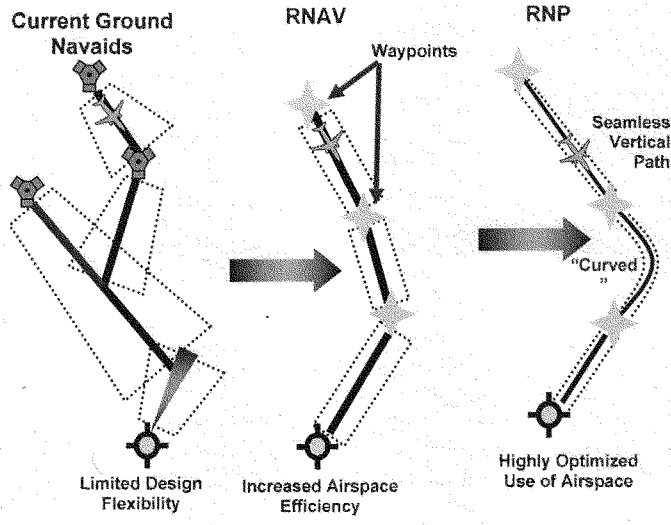
environmental impacts of moving routes and procedures outside of existing ground tracks to provide more direct, fuel efficient routes into and out of airports. However, these new routes may require more extensive environmental reviews, which in some instances could take up to eight years and cost $5 million per procedure.

Moreover, there are often significant technical challenges with integrating RNAV/RNP procedures into the existing airspace. Congested airspace, as found in nearly all major metropolitan areas, involves complex design requirements with stringent development criteria to include computer modeling, human factors studies, and actual flight and simulator trials.

I. What is RNAV/RNP and How Does it Work?

The process of designing RNAV/RNP procedures involves addressing many factors to ensure that the procedures provide a benefit to the FAA and system operators and are fully integrated into the existing airspace. Some steps that go into designing RNAV/RNP procedures include evaluating: different traffic flows and patterns within the existing airspace; the complexity of airport geometry including traffic flows within departure and arrival corridors; and aircraft equipage mix.

The procedure itself is essentially defined by: 1) a series of waypoints (i.e., specific points in three dimensional space that the aircraft will cross); 2) the horizontal and vertical path the aircraft will take will take over those waypoints; and 3) how an aircraft is expected to fly the path (i.e., altitude, speed, bank angles, etc.) as it progresses over waypoints. The FAA also conducts flight inspections using its own specially-equipped aircraft on the procedure to ensure that the procedure has been properly designed for the airspace, allows for adequate navigation signal reception, and provides adequate clearance from obstacles.



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Source: FAA

Once a procedure concept and design are agreed upon by the relevant stakeholders, usually the carriers serving a particular airport, the FAA captures the RNAV/RNP procedure information on a form. The data captured on the form includes: the procedure name, procedure type (e.g., arrival, departure, or approach), names, latitudes, and longitudes for waypoints.

The FAA transmits the final FAA form for each procedure to FAA's National Flight Data Center (NFDC) where it is entered into the National Airspace System Resources (NASR) database. Once available through NFDC, the private navigation data suppliers, such as Jeppesen, Lido, and Navtech/EAG, translate this information into a standard format that is downloaded into navigation databases. The data is then supplied to avionics vendors, such as Honeywell or General Electric, in electronic form. Avionics vendors load that data into their processing software for further quality checks and to get it ready for loading into aircraft Flight Management Systems (FMS).[6] The vendor then sends the data, contained on a disk or in electronic format, to the airlines to be loaded into aircraft FMS.

RNAV and RNP procedures rely heavily on aircraft avionics, most notably aircraft FMS and the Global Positioning System (GPS). The GPS is satellite-based navigation capability that determines the position of the aircraft at all times. The FMS accesses the RNAV/RNP procedure data in its memory with the path that airplane supposed to be flying, and combines it with the position information it is getting from the GPS to compute where the aircraft is along the procedure path. If the FMS is coupled with aircraft's autopilot, which is the case for most of RNAV/RNP procedures, then the autopilot is flying the aircraft based on the instructions of the FMS such as when to turn, what altitude to keep, what speed to fly for each segment, and so forth.

Different RNAV and RNP levels measure the tolerance and precision that avionics are expected to guide the aircraft along the centerline of the path. Designations such as "RNAV-1," "RNP-2" or "RNP-0.3" refer to the distance (in nautical miles) from the centerline of the path to the border of the path that the avionics are expected to fly the aircraft. In the case of an RNP capable aircraft, the RNP system will alert the pilot if the aircraft gets too close to the border. RNP Special Aircraft and Aircrew Authorization Required (SAAAR) has stricter performance requirements, including additional training for the pilot and better equipped aircraft.

RNAV and RNP equipage have been steadily increasing over the past several years. MITRE-Center for Advanced Aviation System Development (CAASD)[7] analysis of the air transport fleet documents high levels of RNAV and growing levels of RNP equipage. Forecasts of new production aircraft indicate acceleration and continued growth in RNAV/RNP capability. For

[6] The Air Transport Association (ATA) Online "Learning Center" defines a FMS as computerized avionics component found on most commercial and business aircraft to assist pilots in navigation, flight planning, and aircraft control functions. It is composed of four major components: Flight Management Computer (FMC), Auto Flight System (AFS), Navigation System including Inertial Reference System (IRS) and GPS, and Electronic Flight Instrument System (EFIS). **http://learningcenter.airlines.org/Pages/Default.aspx?Filter=f**

[7] MITRE is a non-profit organization and the CAASD was established in 1990 within MITRE. MITRE-CAASD is sponsored by the FAA as a Federally Funded Research and Development Center (FFRDC). An FFRDC meets certain special long-term research or development needs that cannot be met as effectively by existing in-house or contractor resources.

air transport aircraft operations in 2009, RNAV equipage exceeds 90 percent. RNP equipage (specifically RNP 0.3 capable aircraft) exceeds 60 percent. Advanced RNP (specifically RNP 0.3 with curved-path capable aircraft) equipage is nearly 40 percent.

II. RNAV/RNP and NextGen

a. The FAA's Plan, Industry Expectations and Challenges Ahead

According to the GAO, since 2004, the FAA has published more than 260 RNAV procedures (i.e., the departure and arrival portion of a flight just before and just after the aircraft enters or leaves en route airspace), more than 135 RNAV routes (i.e., the en route airspace portion of a flight), and 135 RNP approaches (i.e., the portion of a flight that is after the arrival and just before landing).[8] GAO states that FAA estimates that the following numbers of procedures remain to be developed:[9]

FAA's Estimate of the RNAV/RNP Procedures Needed in the NAS

Procedure type	Development targets
RNAV/RNP procedures (arrivals and departures)	2,000-4,000
RNAV/RNP routes	800-1,200
RNP approaches	1,000-2,000

Source: GAO (citing the FAA)

According to the GAO, FAA officials state that the agency plans to annually publish 50 RNAV/RNP procedures, 50 RNAV routes, and 50 RNP approaches to meet its goals for NextGen. Moreover, the FAA and industry are engaged in establishing new, more aggressive goals for RNAV/RNP procedure development. One longer-term goal is to develop procedures that deconflict and optimize arrival and departure interactions in terminal airspace and that connect city pairs for seamless, end-to-end RNAV/RNP operations.

Nevertheless, given the enormous potential benefits that RNAV/RNP procedures could provide, some industry stakeholders have spurred FAA to be even more aggressive and deploy more procedures more quickly. In addition, some stakeholders have noted that procedure development needs to move beyond basic overlays of existing routes to incorporate more fuel efficient flight paths. FAA officials note that processing time for individual procedures is often dependent on the complexity of the airspace, interactions with other procedures, environmental requirements, and the amount of coordination required between aviation customers, air traffic facilities, and other major stakeholders, such as the airport authority, FAA Flight Standards, and FAA Air Traffic Organization for each route or procedure.

In addition, MITRE has pointed out that overlay routes can, in fact, provide benefits to airlines by using RNP to facilitate Optimized Profile Descents (OPD). While there may be some benefit gained by using RNP approaches for OPD, it is unclear if these benefits would justify the avionics equipage and training costs incurred by system operators.

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[8] GAO *supra.*, note 2.
[9] *Id.*

Section 510 of S. 1451, requires the FAA to set a target of achieving a minimum of 200 RNP procedures each year through 2012.[10] FAA officials state that FAA could produce 200 RNP procedures a year, but that trying to meet such a goal could have unintended consequences and may actually slow the achievement of NextGen benefits.[11] Specifically, FAA claims that setting such a target for the production of routes may result in the promulgation of more overlay routes, which can be more quickly deployed due to the fact that they are more easily integrated into existing airspace and require less environmental due diligence.[12] In other words, the FAA could be forced to implement more overlay routes to meet an annual 200 RNP procedure target simply because overlays are faster and easier to implement.

The FAA believes it needs to take a strategic approach to RNP procedure development that would require integrating these procedures into corresponding and ongoing airspace redesign work.[13] The FAA hopes that this approach will maximize FAA and stakeholder benefits achieved by promoting more efficient routes and use of the available airspace.[14] Likewise, the DOT IG also notes that a level of coordination between airspace redesign projects and RNAV/RNP procedures that currently does not exist will be essential as procedures move beyond overlays and local operations to networking routes between city pairs. Moreover, DOT IG states that the FAA will have to reassess its budget and plans for airspace redesign efforts to ensure adequate and stable funding.

Some stakeholders have stated that FAA has yet to clearly articulate its strategic vision for RNAV/RNP. Regardless, industry stakeholder acceptance of FAA's plan – including the quality and quantity of procedures the FAA produces – will be crucial, because stakeholders will be required to bear the cost of equipping their aircraft to take advantage of these procedures.[15]

In a recent report, the DOT IG also documents a number of other RNAV/RNP implementation challenges, including:[16]

- Controllers must manage a "*mixed equipage environment,*" in which they manage both RNAV/RNP and non-RNAV/RNP aircraft within the same airspace. This may limit the benefits from RNAV/RNP operations.

- The FAA will need to standardize "phraseology" – i.e., the voice communications language between pilots and air traffic controllers regarding RNAV/RNP procedures.

- The FAA will need to ensure that RNAV/RNP development is coordinated with broader modernization efforts (e.g., En Route Automation Modernization).

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[10] Section 511 of S. 1300, *The Aviation Investment and Modernization Act of 2007*, (the Senate's FAA reauthorization from the 110th Congress) also set 200 RNP procedure target.
[11] *FAA response to Chairman Costello question for the record (Apr. 30, 2009): Hearing on the ATC Modernization and the Next Generation Air Transportation System: Near-Term Achievable Goals*, 111th Cong. (Mar. 18, 2009).
[12] *Id.*
[13] *Id.*
[14] *Id.*
[15] ATA estimates the cost of equipage to range from $45,000 to $410,000 per airplane depending on the level of RNP performance, and existing equipment on the airplane, including displays, FMS and GPS. These numbers also include a substantial amount for pilot training.
[16] DOT IG, *supra* note 4.

- FAA will need to develop new criteria for complex RNP procedures, and operators will need to work with FAA for RNP approvals and authorizations.

- Air traffic controller training has, to date, been minimal because the controllers are already familiar with the existing routes. However, new and more sophisticated routes (e.g., networked routes) likely will require additional controller training. According to the FAA, the RNAV/RNP computer-based instruction is undergoing extensive revision to ensure controller training is up to date and certification requirements are met. However, according to the DOT IG, FAA lacks extensive and up-to-date training programs to help controllers understand and manage RNAV/RNP aircraft, and that the FAA's training on new procedures consists of briefings rather than formal courses on RNAV/RNP. DOT IG points out that the controller training issue is particularly important given the large number of developmental controllers in the system.

b. Third-Party Vendors: Southwest Airlines - A Case Study

In 2007, the FAA entered into agreements with two non-governmental third-parties (Naverus and Jeppesen) to design, implement, test, and validate "public"[17] RNP SAAAR procedures. According to the FAA, the intent of the third-party initiative was to provide aviation industry or the international community with FAA-qualified vendors that could develop procedures in and outside of the United States where existing infrastructure was lacking or did not create complex integration and implementation issues.[18] FAA officials state that the agency does not plan to rely on third parties to help speed the adoption of RNP procedures to meet the FAA NextGen goals, although it may rely on third-party expertise for specific projects.[19]

The president of the union representing technicians and specialists who certify and maintain FAA equipment and procedures, the Professional Aviation Safety Specialists, has repeatedly expressed doubts about the FAA's ability to adequately regulate, supervise or review the work of third-party design initiatives. H.R. 915, the "FAA Reauthorization Act of 2009", requires the DOT IG to assess the FAA's reliance on third-parties for development of new procedures and determine the FAA's ability to provide oversight. To date, the DOT IG has stated that the FAA has not established a coordinated oversight framework for third-parties, and that without this foundation, the potential for operational problems and safety risks increases.[20]

Regardless, some airlines believe that third-parties could potentially speed the implementation of RNAV/RNP, and provide more efficient and desirable routes. Likewise, private procedure designers maintain that they can provide airlines with routes that are more responsive to their airline customers' needs. Case in point: Southwest Airlines has been widely credited as an "early adopter" of NextGen. Southwest committed to invest $175 million ($144 million for

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[17] RNP procedures can be developed as "public" or "special" procedures. Public procedures are available to all users that have properly equipped aircraft, and have historically been paid for by the FAA. Special procedures are only available for a specific air carrier for which the procedure was designed, and generally paid for by that carrier. While FAA allows special procedures, historically these have been implemented only on a limited case-by-case basis.

[18] FAA *supra.*, note 11.

[19] *Id.*

[20] Section 510 of S. 1451 would authorize the FAA to expand the role of third-parties to implement RNP procedures.

equipage, $22 million for pilot training; $9 other expenses) to implement RNP. In some cases, Southwest is utilizing the services of Naverus, a company formed by former Alaska Airlines technical pilots who pioneered RNP procedures, to design proprietary "special" RNP approach, departure, and en route instrument procedures.

Southwest Airlines' initial plan was to deploy special procedures to all 65 airports that Southwest served. Southwest envisioned that its customized RNP approaches will provide a much shorter track over the ground to the runway than radar vectors and already developed FAA RNAV public procedures. Southwest based its return on investment (ROI) on whether it could gain three miles or one minute of savings per flight. Southwest representatives indicate that the airline will not be successful in achieving its ROI if the FAA continues to create overlay type procedures. Southwest is starting to develop RNP procedures at Dallas Love Field and Houston Hobby Airport.

FAA officials have recently expressed concern with the proprietary nature of Southwest's approach, testifying before House Aviation Subcommittee, "The primary concern we have is the proposed operations for the Dallas/Houston project are exclusive to Southwest Airlines, developed with proprietary criteria that may not conform to common flight tracks or other instrument operations at the affected airports."[21] Moreover, according to the DOT IG, some FAA officials have expressed additional concerns that other air carriers may follow Southwest's approach and will increasingly request customized special procedures that could complicate the workload of air traffic controllers and increase the complexity of the NAS.

In any case, Southwest representatives indicate that last year the airline revised its plan to embrace the use of any procedures, including public procedures that could meet Southwest's operational needs. More recently, Southwest representatives have expressed frustration with aspects of the implementation process that seem independent of its decision to use a third-party developer to design special procedures - most notably the environmental review process. It appears that non-overlay special procedures designed by a private vendor face similar sorts of integration and environmental challenges as public procedures designed by the FAA.

c. Environmental Challenges

The National Environmental Policy Act (NEPA) institutes environmental policies that apply to the Federal Government, including environmental review procedures on Federal agency actions. NEPA requires agencies to evaluate the latent environmental impacts of their projects and document their review in a publicly available document. The scale of review and documentation are determined by the scale of anticipated environmental impacts: a categorical exclusion (CE), an environmental assessment (EA) and an environmental impact statement (EIS).

CEs[22] are used for categories of actions that have been determined not to have a significant effect on the human environment, individually or cumulatively, and therefore, do not require further analysis. Even though a CE represents a determination that an environmental review is not necessary, the determination still must be documented, and extraordinary circumstances could push a CE to an EA.

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[21] FAA *supra.*, note 11.
[22] 40 C.F.R. § 1508.4.

EAs[23] are conducted to determine whether an EIS is needed or a finding of no significant impact (FONSI) is appropriate. An EIS[24] is the most extensive review, and must discuss an adequate range of proposed alternatives, the direct, indirect, and cumulative effects or impacts of each, and may take years to produce. EISs are followed by the issuance of the Record of Decision (ROD) by the agency. Agencies must also take into consideration other future actions to evaluate the cumulative effect on the environment.

Agencies have been encouraged to develop more CEs in their policies because classifying actions under CEs is less of a burden on agency resources than EAs or EISs.[25] The FAA, for example, added 18 CEs to its list in 2004.

All new aviation procedures, including the establishment, modification, or application of airspace and air traffic procedures, are reviewed to assure compliance with environmental laws and regulations in accordance with FAA Order 1050.1. At one airport, it is possible that several different environmental reviews may have to take place for different procedures. The Air Traffic Noise Screening Tool (NST) is a computerized system that evaluates proposed changes in airspace and air traffic procedures to determine the level of environmental review required. NST evaluates proposed changes in arrival procedures up to 7,000 feet above ground level (AGL) and departure procedures up to 10,000 feet AGL. When a change increases noise of five decibels (dB) Day Night Level (DNL) (the average aircraft noise level over a 24-hour period averaged over the course of a year) or greater, the FAA judges if there are changes in accordance with Order 1050.1 that warrant an environmental assessment. Currently, any analysis of aircraft noise above 10,000 feet is an exception to FAA procedures, though the FAA does make an exception for analyzing aircraft noise between 10,000 and 18,000 feet over noise sensitive areas like national parks.

According to the FAA, if a change to an air traffic procedure is within the current footprint, as would likely be the case with an RNP overlay route, a CE will usually be granted. If the procedure is slightly outside the current footprint and a CE will not cover the changes, a focused EA may be done. The difference between an EA, which normally takes 12-18 months and a focused EA, which takes 6-12 months is the number of impact categories that must be evaluated.

If the procedure is completely outside of the current footprint, as could be the case for a more direct RNP procedures desired by airlines, a full environmental review will be required. This review could be an EA or, it may result in the need to complete an EIS, which may take up to two years (DOT IG states that is could be as many as eight years). The cost to conduct these environmental reviews ranges from $250,000 to $1 million for an EA, and several millions of dollars for a full EIS. In the case of a public procedure, FAA would bear this cost. In the case of a special procedure, the carrier would bear this cost.

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[23] 40 C.F.R. § 1508.9(a)(1). An EA that results in a FONSI is referred to as an EA-FONSI.

[24] 40 C.F.R. § 1501.4, and parts 1502 and 1503.

[25] *Establishing, Revising, and Using Categorical Exclusions under the National Environmental Policy Act*, 70 Fed. Reg. 54816, 54817 (Sept. 19, 2006).

WITNESSES

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Alaska Airlines
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Air Transport Association

HEARING ON ″NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED NAVIGATION PERFORMANCE (RNP)″

Wednesday, July 29, 2009

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON AVIATION,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 2167, Rayburn House Office Building, Hon. Jerry F. Costello [Chairman of the Subcommittee] presiding.

Mr. COSTELLO. The Subcommittee will come to order. The Chair will ask that all Members, staff, and everyone in the room turn electronic devices off or put them on vibrate.

The Subcommittee is meeting today to hear testimony on ″NextGen: Area Navigation and Required Navigation Performance Performance.″ The Chair would ask unanimous consent that the gentleman from Alaska, the former Chairman of the Full Committee, Mr. Young, a Member of the Full Committee, be allowed to participate in today's Subcommittee hearing. Without objection, so ordered.

I have a lengthy opening statement that I will submit for the record and then recognize my Ranking Member, Mr. Petri, for any remarks he may have, and then we will go directly to witnesses.

I welcome everyone here to the Subcommittee hearing on ″NextGen: Area Navigation and Required Navigation Performance.″ The employment of RNAV and RNP procedures are key near to midterm NextGen initiatives. RNAV and RNP procedures are part of the Federal Aviation Administration's NextGen implementation plan and are expected to be a major part of the NextGen midterm implementation task force final report that is due next month.

Let me say that we have indicated in the past, since I have been Chair of the Subcommittee and even before that, when we have been examining NextGen and its progress that we would hold hearings from time to time to get a progress report as to where we are, where we are headed, and this hearing today is a part of that commitment.

With that, the Chair would recognize my Ranking Member, Mr. Petri, for any remarks that he might have.

Mr. PETRI. Thank you very much, Mr. Chairman. I do want to submit my full statement for the record and just say that I very much thank you for having another of a series of meetings and

hearings that this Subcommittee has had on NextGen and issues surrounding it.

This is a major undertaking. It is outside the normal scope of the FAA as a line agency to come up with a whole new technology, and there are a lot of issues involved in how to—not just technical issues, but business issues as to how to roll out this new technology in a way that is attractive and used by the community and that people will buy into because it is in their interest to do it at various stages of the procedure.

So I am hopeful that there will be even more discussion and consultation and work to kind of come up with a roadmap that makes sense for the aviation community for rolling this out so that it can be used by different companies and in a way that maybe gives them a little competitive edge and incentivizes their competitors to buy into it rather than being done sort of a mandate approach.

There are a lot of issues involved in this whole area, and it is clearly very important to try to get it right in advance rather than pointing fingers, as often happens with various major Federal undertakings, because things haven't worked after the fact.

And with that, I thank all of our witnesses for being here and look forward to your testimony.

Mr. COSTELLO. I thank the Ranking Member and would advise all Members that their full statement will be submitted and appear in the record.

The Chair would now recognize and introduce our witnesses today. Let me say to each of our witnesses that your full statement will appear in the record as well. It will be in the record as you submit it. We would ask that you summarize your testimony in 5 minutes, and that will allow for us to have adequate time to ask questions.

The first witness will be Mr. Richard L. Day, who is the Senior Vice President for Operations, Air Traffic Organization, Federal Aviation Administration.

Ms. Ann Calvaresi Barr, who is the Principal Assistant Inspector General for Auditing and Evaluation with the U.S. Department of Transportation.

Dr. Agam Sinha, who is the Senior Vice President and General Manager for the Center of Advanced Aviation System Development at the MITRE Corporation.

Mr. Tom Brantley, the President of the Professional Aviation Safety Specialists, AFL-CIO.

Mr. Chet Fuller, who is the President of GE Aviation Systems, Civil.

Captain Jeff Martin, the Senior Director of Flight Operations of Southwest Airlines.

Mr. Brad Thomann, who is the Senior Vice President and Chief Operating Officer with JEPPESEN, a Boeing company.

And Captain Gary Beck, who is the Vice President of Flight Operations of Alaska Airlines on behalf of the Air Transport Association.

So ladies and gentlemen, your statement will appear in the record. And at this time I would call on Mr. Day to offer your testimony.

TESTIMONY OF RICHARD L. DAY, SENIOR VICE PRESIDENT FOR OPERATIONS, AIR TRAFFIC ORGANIZATION, FEDERAL AVIATION ADMINISTRATION; ANN CALVARESI BARR, PRINCIPAL ASSISTANT INSPECTOR GENERAL FOR AUDITING AND EVALUATION, U.S. DEPARTMENT OF TRANSPORTATION; DR. AGAM N. SINHA, SENIOR VICE PRESIDENT AND GENERAL MANAGER, CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT, THE MITRE CORPORATION; TOM BRANTLEY, PRESIDENT, PROFESSIONAL AVIATION SAFETY SPECIALISTS, AFL-CIO; CHET FULLER, PRESIDENT, GE AVIATION SYSTEMS, CIVIL; CAPTAIN JEFF MARTIN, SENIOR DIRECTOR, FLIGHT OPERATIONS, SOUTHWEST AIRLINES; BRAD THOMANN, SENIOR VICE PRESIDENT AND CHIEF OPERATING OFFICER, JEPPESEN, A BOEING COMPANY; AND CAPTAIN GARY BECK, VICE PRESIDENT, FLIGHT OPERATIONS, ALASKA AIRLINES, ON BEHALF OF AIR TRANSPORT ASSOCIATION

Mr. DAY. Thank you, Chairman Costello, Ranking Member Petri, and Members of the Subcommittee, and thank you for inviting me here today to discuss the FAA's program for RNAV and RNP.

These are some of what we call Performance-based Navigational Procedures, or PBN. PBN requires a certain level of performance from the aircraft and the air crew to fly a certain type of air traffic procedure. It used to be that aircraft could navigate primarily by ground-based navigational aids. Depending on the location and the position of those navigational sources, the aircraft was limited in how efficiently and precisely it could fly. Now, with advances in technology, we are able to take advantage of space-based navigational sources, such as GPS.

RNAV and RNP gives greater aircraft flexibility in flight paths and profiles, and it enables them to fly more precise and efficient routes. This leads to potential for flights to reduce the miles flown, save fuel, and improve efficiency. The development of RNAV/RNP procedures is a relatively young program at the FAA, as you can see from the slide—and I know it is difficult to see—which shows the current state of RNAV/RNP implementation.

Since 2002, we have accomplished quite a bit. Currently, we have 159 RNAV routes and 270 RNAV arrival and departure procedures implemented into the NAS. We also have an additional 163 RNP special aircraft and air crew required approaches, or SAAAR approach procedures in the NAS. By the end of fiscal year 2009, we anticipate that we will have an additional 48 RNAV routes, 35 RNAV arrival and departure procedures, and 29 RNP SAAAR approach procedures in place. Overall, we have over 8,000 PBN procedures throughout the NAS.

Along the way, we have encountered some challenges and we have learned from them. We intend to apply those lessons learned as we move forward. For example, while we have a standard process for developing RNAV and RNP procedures in the terminal area, we do not have a comparable process for developing procedures elsewhere in the operational environment. We believe this is an area where we can improve by mapping agencywide all the PBN processes to standardize how we develop, test, chart, and imple-

ment PBN procedures. I am pleased to report that we should be starting work on the mapping process in the next couple of weeks.

As we move forward, there are other challenges that continue to face us in the advancement of RNAV and RNP. First on the list of challenges is prioritization of which procedures to create and implement and in what order. Second are the environmental issues which require time for us to examine. Third, as the industry moves to equip, we are seeing a hybrid equipage environment where some aircraft are capable of flying RNAV/RNP and others are not.

Some of our other technical challenges are illustrated in the second slide that we have prepared for this hearing. Each phase of flight faces unique challenges. For example, for departures and arrivals we may be faced with deconflicting air traffic between adjacent airports. In the en route environment, we may need to avoid restricted military space, and for arrivals and departures we want to ensure that we provide our controllers with the right tools to make the right decisions when managing the air traffic.

I want to assure you that the FAA has developed a solid foundation of routes and procedures for RNAV/RNP as part of NextGen. Using this foundation, we are transitioning from a site-by-site or runway-by-runway implementation process for a NextGen readiness concept by treating the system as a network. This will include development of an integrated system of PBN routes and procedures NAS-wide. This broader view will help to advance and accelerate NextGen as much as possible.

Mr. Chairman, Ranking Member Petri, Members of the Subcommittee, this concludes my prepared remarks, and I look forward to your questions.

Mr. COSTELLO. The Chair thanks you, Mr. Day, and now recognizes Ms. Calvaresi Barr.

Ms. CALVARESI BARR. Thank you, Mr. Chairman, Members of the Subcommittee. I appreciate you inviting us here to this important hearing on FAA's efforts to modernize the use of airspace through RNAV and RNP. Inspector General Scovel regrets not being able to make it here today due to a family medical matter. However, I can assure you that this statement has received his full attention.

As you know, RNAV/RNP are key to the success of FAA's NextGen. They are the legs of the table. Without them NextGen will not function. By relying on satellite navigation and on-board avionics to maximize airspace, RNAV and RNP could achieve substantial benefits, including fuel savings and improved airport arrival rates.

While RNAV and RNP have considerable industry support, some stakeholders are dissatisfied with FAA's overall method for implementing these initiatives. Today I will focus on two key areas: first, implementation concerns that limit the benefits of RNAV and RNP and, second, the lack of clarity surrounding the role and oversight of third parties in developing new procedures.

RNAV/RNP have achieved some benefits, but FAA must address several concerns to realize their full potential. First, FAA has yet to develop unique routes. Instead, the agency places new routes over existing ones and continues to focus on the quantity rather than the quality of new flight paths. As airline representatives

know, the new routes provide few, if any, added benefits because they are essentially the same ones that airlines already fly.

Another longstanding concern is the potential impact mixed equipage will have on RNP's implementation. Experts believe most aircraft will need to be equipped with advanced avionics to realize benefits. Equipping the aircraft has been a subject of intense debate. Until this is resolved, concerns remain that mixed equipage will increase controller workload and may introduce new hazards in the congested airspace. We are particularly concerned about this given the large number of developmental controllers in the system.

A third concern is that FAA has not developed a plan to effectively manage interdependent efforts, including RNAV and RNP, airspace redesign, and air traffic control modernization systems. All of these efforts must be fully integrated and synchronized to maximize benefits. As FAA begins to develop more complex and demanding routes and procedures, it will need to reevaluate, align, and coordinate plans and budgets as well as address controller and pilot training needs.

Now I would like to focus on the second key area regarding third parties. The role of third parties in developing RNP procedures is unclear, and industry is skeptical of FAA's ability to deliver the more complex procedures. At industry's request, FAA entered into agreements with two third parties to design and develop certain RNP procedures. Airlines believe third parties could provide expertise and resources to complement FAA's efforts and to achieve quality procedures. However, FAA program officials told us that they do not plan to use third parties to speed RNP adoption because FAA is meeting its annual production goals.

As part of the agreement, FAA provided an option for carriers to use third parties to develop public procedures--those that can be used by all airlines with equipped aircraft. But we question the soundness of this business case because it is unlikely that carriers will invest in procedures that other carriers will benefit from at no cost. Air carriers that choose to use third parties to develop public procedures would essentially be investing in their competitors.

From the carriers' perspective a more logical business case would be to use special RNP procedures, those that are designed specifically for their use and are not available to other carriers. However, FAA is concerned that an increasing number of special procedures will further burden controllers and complicate the airspace.

Ultimately, the role of third parties will require an understanding of the in-house skill mix and expertise of FAA, but this type of assessment has not been done. Absent clear roles and responsibilities, it is difficult for FAA to establish a plan to oversee third parties.

Over the next decade, FAA and the industry plan to invest billions of dollars in RNAV/RNP and other NextGen efforts. To better ensure efficient use of taxpayer and industry dollars, we will continually monitor FAA's vision and strategy for RNAV/RNP, the role and use of third parties, and training needs for controllers and pilots.

Mr. Chairman, this concludes my statement. I would be happy to answer any questions that you or other Members of the Subcommittee may have. Thank you.

Mr. COSTELLO. The Chair thanks you and now recognizes Dr. Sinha.

Mr. SINHA. Good morning, Chairman Costello, Ranking Member Petri, and Members of the Subcommittee. Thank you for inviting me to participate in today's hearing on NextGen: RNAV and RNP. My testimony today will highlight some examples of RNAV and RNP applications which together form the performance-based navigation initiative, commonly known as PBN, and constitute a foundational element of NextGen.

RNAV enables aircraft to fly any desired path rather than flying to or from a fixed ground navigation aid. RNP takes advantage of more advanced on-board avionics to monitor the aircraft's navigation performance and to alert pilots when the required performance is not being achieved.

RNAV and RNP equipage has been steadily increasing over the last several years. For air transport aircraft operations in 2009, RNAV equipage exceeds 90 percent, RNP equipage exceeds 60 percent, and advanced RNP equipage with curved-path capabilities is nearly 40 percent.

RNAV and RNP procedures are being implemented to achieve repeatable and predictable departure, en route, arrival, and approach paths for aircraft. RNAV departure procedures implemented at Atlanta in 2006 have shown a measured capacity gain of 9 to 12 departures per hour. RNAV procedures also result in reducing the workload associated with the routine voice communications between pilot and air traffic controllers. Atlanta RNAV departure procedures show a decrease of about 50 percent in voice communications required between the pilots and controllers.

Similar RNAV procedures have been implemented at airports such as Dallas/Fort Worth, Las Vegas and Phoenix with a cumulative savings of $130 million from 2006 to 2008. RNP procedures at Portland have resulted in fuel savings of 150,000 gallons and a reduction of 7,500 tons of carbon emissions since implementation in 2006.

In many metropolitan areas, arrival and departure paths at nearby airports can interfere with each other. Decoupling operations at Chicago O'Hare and Midway through the use of an RNAV departure procedure at Chicago O'Hare in combination with an RNP approach for Chicago Midway has been modeled to show a savings of approximately $4-1/2 million per year in reduced delays under a full PBN equipage scenario.

RNP SAAAR that Rick Day has defined can provide an alternative means of access to runway ends that currently cannot support an ILS. At Palm Springs airport, Alaska Airlines has reported over 20 instances where they were able to complete the flight and land at Palm Springs using RNP SAAAR approaches since its implementation in 2005.

Within the descent phase of flight, a strategy for reducing fuel use and emissions is to minimize the use of level offs. A general term for the broad class of descent routes and procedures which are designed to reduce fuel and carbon emissions during descent is Optimized Profiled Descents (OPDs). Several domestic trial implementations of regularly scheduled flights have shown significant promise. OPD flight trials at Atlanta and Miami during 2008 involved

20 flights, with a fuel savings of 50 gallons per flight and a carbon emissions reduction of approximately 450 kilograms per flight.

MITRE recently conducted a nationwide analysis of arrival flows at over 100 airports to assess the potential application and benefits of OPD procedures. Ten airports were identified with less complex airspace structures and flows where OPDs can be implemented in the near term. The estimated range of benefits achieved at those airports is equivalent to removing 4,400 to 13,000 cars off the road every year. At larger airports the benefits are higher but the implementation of OPD is more complex and is likely to require a longer time.

Beyond the near term, there are opportunities to combine different NextGen capabilities to achieve even greater benefits. Concepts for approaches to closely spaced parallel runways combine the use of ADS-B and RNP capabilities with the potential capacity benefit of adding 15 to 22 arrivals during instrument meteorological conditions at airports such as San Francisco, Los Angeles, and Seattle.

In summary, RNAV and RNP implementation over the past few years have resulted in significant benefits. These implementations have been successful due to the close collaboration between the FAA and the aviation community through forums such as RTCA and the Performance-based Operations Aviation Rulemaking Committee, commonly known as PARC.

As we move forward, we must consider the implementation of those RNAV and RNP procedures that result in measurable high benefits to the community, not just the number of procedures that are implemented. Furthermore, we suggest a focus on implementing OPD procedures at airports with less complex airspace structures and flows which can more easily be achieved in the near term. OPD procedures implementation at airports with more complex airspace structures and flows should be undertaken as a part of a more comprehensive airspace design.

Finally, as we look ahead, RNAV and RNP, in combination with other capabilities such as ADS-B, data communications, enhanced ground automation capabilities, and safe reduction in separation standards, can result in even greater benefits.

Mr. Chairman, this concludes my testimony. I would be happy to answer any questions the Committee may have.

Mr. COSTELLO. Thank you, Dr. Sinha. The Chair now recognizes Mr. Brantley.

Mr. BRANTLEY. Chairman Costello, Congressman Petri and Members of the Subcommittee, thank you for inviting us to testify today on RNAV/RNP.

PASS represents approximately 11,000 FAA employees throughout the United States and overseas, including the flight procedures development specialists, flight inspection pilots, and mission specialists in aviation systems standards.

It is generally accepted that the use of new performance-based routes and procedures has great potential to enhance system capacity and reduce environmental impact and fuel costs. However, a lack of clear guidance from the FAA has led to conflicting ideas among the industry, FAA, and even congressional proponents as to how these benefits can best be realized.

An agenda supported by many in the aviation industry and advanced by some Members of Congress is to set quotas for the production of new RNP procedures without regard for the feasibility of such a plan. PASS believes that quotas are unrealistic, very likely unachievable, and are not based on the potential safety, capacity, and operational benefits to the overall NAS.

NextGen's promise is founded on shifting from ground-based to satellite-based operation. This will not be accomplished solely through the use of new technology. It will be a mix of new technology procedures and operations that will transform our current system into the one promised by NextGen. But it seems that the drive for industry to equip with new technology to realize benefits as soon as possible may lead to unintended problems that could actually delay those gains. The best equipped, best served policy offered by the FAA may not be the best way to promote the adoption of new technology by users.

Since the FAA left it to the RTCA NextGen Implementation Task Force to define the specific policy details, the priority treatment promised by the FAA is unclear. Yet the rush to gain this priority treatment has begun. The very complex issues involved in developing and implementing new RNP procedures in support of NextGen won't necessarily align themselves with the best equipped, best served policy.

The work involves developing an integrated infrastructure, not individual stand-alone procedures. Obstruction and environmental issues must be resolved; controlled airspace and air traffic flow must be taken into consideration; any needed airspace rulemaking processes must be initiated; and coordination with air traffic is needed to ensure that the new procedure can be safely integrated into the management of the overall airspace.

Additionally, during the development of a new procedure, changes in other procedures are often identified, and further coordination must take place to ensure that everything continues to work together.

The numbers of special use procedures meant for the benefit of the user developing them have always been small in comparison to public use procedures which are meant for the use of all qualified users of the system. However, the push to develop thousands of new special use procedures would require a coordination unlike any we have ever seen. Without extensive oversight, these new procedures may not fit ongoing airspace redesign efforts, and they may conflict with other RNP development that is underway at the same time. To assume that all conflict with public use procedures will be resolved through the FAA's best equipped, best served policy is unrealistic.

PASS also feels that any policy change to allow third parties to develop public use RNP procedures is misguided. PASS believes this safety critical work to be inherently governmental. As such it should not be outsourced to private vendors. Additionally, the changes in air traffic operations that will be required for a systematic transition to the capabilities offered by NextGen must not be unduly rushed. We cannot forget that the changes that are coming include people, not just technology and procedures.

The FAA has said that it believes it needs to take a strategic approach to RNP/RNAV procedures development and any corresponding airspace redesign work that is required to deploy those procedures. PASS agrees with this approach and stands ready to work with the FAA and other stakeholders to accomplish the transition to the new capabilities.

That concludes my statement and I thank the Subcommittee for having me here today.

Mr. COSTELLO. The Chair thanks you, Mr. Brantley, and now recognizes Mr. Fuller.

Mr. FULLER. Mr. Chairman, Members of the Committee, thank you for opportunity to testify today. There are a few things I would like you to believe about RNP.

First, RNP means greater accuracy and precision and RNP enables efficiency. It is through RNP that operators and the flying public will derive the value of the NextGen air traffic management system.

Second, RNP provides enormous environmental benefits.

Third, RNP is fundamental to the transition from the past to the future.

Fourth, the technology is ready today. All we have to do to reap the benefits of RNP is accelerate implementation.

GE Aviation is a leader in efficient technology, known for its innovation in aircraft engines. But GE Aviation's navigation systems have guided the world's most successful aircraft for almost 2 decades. In fact, every 2.7 seconds an aircraft goes airborne with a GE Aviation flight management system computer guiding it.

Our current ATC system is outdated. It is a very large sky, but we don't use very much of it, and what we do use, we use pretty inefficiently. The airways we fly today are 8 nautical miles wide because they have to be.

Radar was a technical wonder 50 years ago, but today it is an anachronism. Today's GPS equipped aircraft are almost always within a wingspan of airway centerline. The improved navigation accuracy in all four dimensions enables increased airspace capacity and efficiency.

Let me tell you about a couple of examples which showcase the benefit of RNP and GE's technology. In Brisbane, Australia, Qantas has been the lead carrier in a project that has demonstrated that air traffic controllers can integrate RNP capable aircraft and non-RNP capable aircraft in a medium traffic density environment. They have already implemented RNP at 15 Australian airports and are saving fuel and carbon today.

Another demonstration conducted by Scandinavian Airlines in Sweden has taken RNP one step further and added the dimension of time. Time increases predictability. With four dimensional trajectory-based operations, they have added the ability to deconflict traffic through trajectory negotiation. In thousands of approaches into Stockholm, they have reduced by over 50 percent the area affected by noise greater than 65 db through the use of RNP and 4D TBO.

In the case of RNP, it should be noted that all approaches are not created equal. If you take an existing approach and merely recreate it so that it might be flown using RNP equipment and pro-

cedures, you get exactly the same results. No reduction in noise, no reduction in fuel, and no reduction in distance traveled. Unfortunately, many of the RNP procedures posted in the United States over the last few years simply replicate the existing ground-based navigation procedures and in doing so create very little benefit.

We support the emphasis on measuring the benefits of new RNP procedures as included in the Senate's FAA reauthorization bill. We should increase the rate of RNP procedure deployment and have metrics to ensure their effectiveness. RNP offers substantial environmental benefits. It is estimated that RNP has the potential to cut global CO-2 emissions by 13 million metric tons. That is 1.2 billion gallons of fuel. This is a very important path to energy independence.

Oddly enough, one of the factors slowing down the proliferation of RNP procedures is the environment. Because the RNP path differs from the path of the previous instrument approach there is some question as to whether an environmental impact statement is required to determine the impact of new RNP paths. While this is a valid concern, there are immediate ways that beneficial RNP paths can be designed that will not require environmental review. In particular, RNP routes could be designed in a way that replicate the routes taken by aircraft on visual approaches over the same track of ground.

The benefits of RNP are very clear. So what should we do? We think we should accelerate the creation of high quality RNP procedures that use aircraft performance to drive the efficiency. We think that, second, we need to create metrics for success and measure approaches based on their efficiency.

Third, we need to accelerate the movement toward 4-dimension trajectory-based operations and add time as an element of the approach design.

And fourth, we need to integrate the efforts around communications, navigation, and surveillance so that there is one strategy and one vision. We think the time is now to work together for the benefit of the environment, the airline, and the flying public.

Thank you very much for your time.

Mr. COSTELLO. The Chair thanks you, Mr. Fuller, and now recognizes Captain Martin.

Mr. MARTIN. Thank you, Chairman Costello, Ranking Member Petri, and Members of the Subcommittee. My name is Jeff Martin. I am the senior director of flight operations and a Captain for Southwest Airlines. Since 2006, I have been directing Southwest's NextGen program, training our nearly 6,000 pilots and equipping more than 500 Boeing 737 aircraft in RNP and associated NextGen efforts.

Like Southwest, our RNP project is unique. In March of 2007, Southwest made an unprecedented commitment of $175 million to advance NextGen and make RNP an integral part of our day-to-day operations.

Southwest based our business plan and set the standard for a return on investment by determining that we need to reduce our flight track miles by 3 miles per leg. Reducing flight track miles burns less fuel. Fuel is an airline's highest cost behind labor. So

there is a national incentive for airlines to reduce fuel burn. That also translates into reduced aircraft emissions and lower fuel costs.

Southwest NextGen RNP project can be broken down into four distinct work areas. One, aircraft equipage and modification. Each of our 500 aircraft required some equipment modification that consumed over 80 percent of our NextGen budget. Today 66 percent of our fleet is RNP capable, and we will complete our remaining motivations within 4 years.

Two, FAA regulatory approval. For 2 years Southwest has been working with the FAA towards achieving regulatory approval. We learned last night that we had received FAA approval from the FAA to proceed to our next level of our RNP certification.

Three, pilot training. Training is already underway, but developing that curriculum took 19 months and consumed 13 percent of our budget.

And fourth and last, airport procedures. Southwest is working closely with the FAA to assist in the design of new RNP flight procedures. Our goal is to have at least one carbon negative RNP procedure at each of the airports we serve, much like Chicago's Midway Airport as you can see on the screen. It is safe, it deconflicts two airports, it reduces fuel and reduces emissions.

A recent audit of our airport procedures revealed that we have 412 runway ends that we serve. Of these 412 runway ends, 69 RNP procedures currently exist. Of these 69 procedures, 6 would reduce fuel and reduce emissions.

From start to finish, Southwest's RNP program will take 6 years. In addition to time and money, it has required focus, project oversight, and considerable attention to human factors such as education and training.

As mentioned, RNP benefits the environment, it benefits the consumer, it benefits the carrier. By using available technologies like RNP, the implementation of NextGen can be accelerated. If implemented correctly and widely throughout the national aviation system, RNP will, one, strengthen our environment by greatly reducing the amount of fuel we consume and greenhouse gases we emit; two, provide our customers with less congestion and fewer delays; and, three, improve safety and operational performance of the aviation industry.

Based on Southwest Airline's own demonstration flights, RNP can reduce fuel burn and carbon dioxide emissions by as much as 6 percent per flight. Translating those savings across our entire fleet, we can burn 90.6 million less gallons of fuel and reduce our CO-2 emissions by 1.9 billion pounds annually at Southwest airlines.

NextGen's success is dependent on industry and government working together. We have worked closely with the FAA from day one and we continue to have quarterly meetings with the FAA Administrator. The FAA Administrator, Randy Babbitt, said—and I quote—we must take advantage of what operators already have invested.

RNAV and RNP work. We know that. With the airlines and the economy still looking at a steep climb, the return on investment is even more important. Southwest Airlines could not agree more.

Achieving a return on investment is necessary to justify continued NextGen efforts.

Let me conclude with lessons learned. During the past 3 years, our airline has been fully engaged and committed to our NextGen project. We have already equipped over 300 aircraft and will complete our pilot training by 2010. Developing and implementing our RNP project is without a doubt one of the most complicated, time consuming, and expensive projects that Southwest Airlines has undertaken.

In order for the industry and the public to achieve the full benefits of RNP, it is incumbent on the FAA to design and implement flight procedures like those at Chicago's Midway Airport. For NextGen to succeed, FAA, airlines, and other stakeholders must all be in sync.

Existing regulations and guidelines from the 1960s and 1970s need to be updated in order to utilize and benefit from NextGen capabilities and technology. Successful use of RNP and NextGen requires, one, a definable return on investment; two, an emphasis on the quality of the procedure, not just meeting a quota for production; and, three, a mandate to design and implement new flight procedures that will reduce airline emissions and fuel burned.

Southwest Airlines is proud to be leading the industry in deploying our 500 aircraft into NextGen airspace. Thank you for this opportunity to testify and to share our thoughts and experiences with RNP. We look forward to working with the FAA, elected officials, and industry stakeholders in ensuring RNP's future success. Southwest Airlines remains committed to RNP and NextGen.

Thank you, Mr. Chairman.

Mr. COSTELLO. The Chair thanks you, Captain Martin, and recognizes Mr. Thomann.

Mr. THOMANN. Chairman Costello, Ranking Member Petri, distinguished Members of the Subcommittee, my name is Brad Thomann, and I am the Senior Vice President and Chief Operating Officer at JEPPESEN.

JEPPESEN is a wholly owned subsidiary of the Boeing Company based near Denver in Inglewood, Colorado. For more than 75 years, our company has been the premier provider of navigation charts, databases, and other information solutions to the general aviation, business aviation, and commercial entities around the world in airlines.

Mr. Chairman, I really appreciate your convening this hearing to discuss NextGen and RNAV and RNP. JEPPESEN and Boeing believe these procedures are an essential element in the NextGen transformation. In the previous testimony, we have heard a lot about what RNP is. Please allow me to show you visually what we are talking about.

So what we are looking at here is a traditional approach. These traditional approaches are typically based upon land-based navigation or way points off those land-based navigation. There is large buffers around terrain and obstacles and restricted airspace. There is a complex network obviously to these base navigational facilities. And typically in approach procedures pilots do what we call a dive and drive procedure where we hit a way point or we hit one of these navigational aids and reduce power and we come down. And

that is how in this case we make a descent into the airport and for the landing where we catch the ILS or the localizer. A dive and drive procedure is not very fuel efficient, nor is it environmentally friendly.

Now, a vast majority of the instrument approaches in the world today are flown according to this design philosophy. This is well established, very safe, but we all agree it is near its maximum capability in terms of efficiency, carbon emissions, and capacity.

So let me show you, Mr. Chairman, now what the future looks like. Let us look at RNP. So this is an RNP approach. And again as we have talked already in testimony, it is a satellite-based navigation based on GPS with RNAV performance monitoring. RNP of course requires special certifications with the pilot, the airplane, close coordination obviously with ATC. There is training and equipment that Captain Martin talked about. But it gives us a lot greater design flexibility. It allows us to do curve-path approaches, stabilize continuous descent, which is safer, gives pilots—I think the pilots in this room would disagree—or agree. It gives us a lot more situational awareness as we are flying stabilized approaches rather than dive and drive, And it puts us in this very confined and contained and safe containment corridor.

So why do we want to do this? And we have talked about this throughout the panel, but one of the biggest one obviously to pilots in this Committee and us is safety. It allows us to provide these stable approaches, it allows to us get away from this no dive and drive, a continuous descent approaches, pilots obviously would agree that this is a safer method. It gives us protection in engine-out emergencies and ensuring limited areas with the very precise navigation requirement. It is environmentally friendly, as we have already heard. Emissions reductions, noise reductions is critical, not only for the aviation community, the business and general aviation community, but the military community as well.

And of course we have heard about the financial savings. We get fuel savings as we have less path that we travel over the ground. We get fuel savings as we have more of an idle approach to this. And that allows the airlines to have greater utilization. Every minute that they can shave off of a flight is another minute they can put in productive service.

RNP is a critical part of Next Generation. The FAA has built over 140 RNP procedures at 42 airports. And as we have heard, some of the procedures do not provide the desired benefit of time or lower minimums to allow us to get in. Only 15 to 25 percent of the aircraft, as I know it right now, are equipped to use RNP and we need continued justification for the airlines to equip like Southwest and Alaska, and that is by building more procedures and allowing RNP to more airlines to participate in and take advantage.

We need more procedures. And third party providers like JEPPESEN can complement and partner and work side by side with the FAA in order to give us more capacity.

However, we do feel that the FAA should conduct ongoing maintenance of procedures once they are built. There is no one better equipped, no one with a greater core competency to understand our national airspace system than the FAA. And so like we are doing currently at JEPPESEN and other providers, we work every day

side by side with the published approaches for the airlines around the world, working with the FAA, and we suggest we continue to have that great working relationship.

So in summary, RNP is a vital part of NextGen. This picture up here is Heng Shan, China, a very complex terrain approach that we designed out in China. It is a technology that is ready now. We don't need to reinvent the wheel. What we do need to do is continue to work together, government and industry, to make this a reality.

Thank you, Mr. Chairman. I would be happy to answer any of your questions.

Mr. COSTELLO. The Chair thanks you, Mr. Thomann, and now recognizes Captain Beck.

Mr. BECK. Thank you, Chairman Costello and Ranking Member Petri and Members of the Subcommittee. My name is Gary Beck. I am the Vice President of Flight Operations for Alaska Airlines. I came to Alaska Airlines from Delta Airlines, where I served as Senior Vice President of Flight Operations and Chief Pilot. I am pleased to testify today on behalf of the Air Transport Association and offer Alaska Airlines' unique experience with and perspective on RNP technology. My testimony today will focus on three key points.

First point, RNP is proven technology. Alaska Airlines has a relatively long history with RNP technology, having pioneered its use during the mid-1990s to improve safety and reliability of our flights operating into and out of Juneau, Alaska, an airport known for its bad weather and challenging mountainous terrain. The first RNP-guided flight path was used by Alaska Airlines to land in Juneau in 1996.

As many of you know, RNP enables aircraft to fly more direct routes with pinpoint accuracy and reduces diversions due to weather by using on-board navigation technology in the Global Positioning System satellite network. It improves safety and reliability in all weather conditions and reduces reliance on ground-based navigational aids.

You could say the rough terrain and equally rough weather in the State of Alaska gave the company the business case to invest early in innovative technology that could help us more reliably and safely serve communities throughout the State.

In doing so, our corporate leaders then took a risk in being the first major U.S. Air carrier to invest in RNP, an unproven technology at that time. We believe that risk was one worth taking. Today we are the only major domestic air carrier with a completely RNP equipped fleet and fully trained crews.

In addition to RNP, our all-Boeing 737 fleet is 100 percent equipped with other modern safety technology, including the Heads-up Guidance System, which allows take-offs and landings at the lowest minimum weather conditions certified by the FAA, as well as the Runway Awareness and Advisory, or RAAS, System, a key tool in alleviating runway incursions. Alaska is the first U.S. passenger carrier to install RAAS on all of its aircraft.

Since that first RNP flight into Juneau in the mid-1990s, Alaska Airlines has launched RNP procedures in partnership and with the approval of the FAA into Palm Springs, San Francisco, Portland,

Oregon, and cities throughout the State of Alaska. Alaska Airlines was also the first carrier to use RNP precision technology to land aircraft at Reagan National Airport right here in Washington, D.C., having worked with the FAA after 9/11 on the development of the Reagan procedures. Recognizing the safety and environmental advantages of RNP approaches and landings, the FAA worked diligently to make the RNP procedures publicly available to all airlines that operate at Reagan national.

In total, Alaska Airlines currently has RNP approaches available to us at 23 airports throughout our system, nine of which we developed with the coordination and approval of the FAA.

In another first on the RNP front, last December, the FAA approved Alaska Airlines to become the first U.S. commercial air carrier to conduct its own RNP flight validation, laying the groundwork for faster procedure approvals.

Second point. RNP saves time, fuel, and emissions. The numbers speak for themselves. For example, in 2008, Alaska Airlines used RNP procedures 12,308 times. 1,774 of these were called saves. A save is defined as an operation that would not have been completed if RNP were not available. In other words, the flight would either have been canceled or diverted. In doing so, we saved 1-1/2 million gallons of fuel, which equates to a savings of approximately 17,000 metric tons of CO-2 emissions. In addition, we realized a savings of $17 million in operating costs.

Third, RNP is a key tool in the NextGen modernization effort. The original purpose of RNP was to provide guidance to runways without Navaids and to reduce minimums. However, RNP is now taking a new path. As part of the NextGen effort, the same technology can and should be used to enhance capacity and create more efficient approach and departure paths. In order for the operational and environmental benefits of these more efficient paths to be realized, the FAA must implement new standards and procedures that enable the technology to be fully utilized. For example, the FAA must develop new reduced separation standards that take advantage of RNP's technological capabilities.

At Sea-Tac airport in Seattle, Alaska Airlines is leading an effort, in partnership with the FAA, the Boeing Company, the Port of Seattle, and Southwest Airlines, to use RNP in just that way to create more efficient paths that will reduce flight path length and in turn reduce time in the air, fuel consumption, emissions, and noise. This Sea-Tac project is leading edge on the RNP front in that it involves the use of RNP in complex airspace, requiring air traffic to be sequenced and spaced at altitude as opposed to in the terminal space.

The lessons learned from and the benefits of the Sea-Tac project can be replicated at major airports across the country. The benefits are impressive. Carriers equipped to fly these procedures at Sea-Tac will save more than 2 million gallons of fuel per year, which equates to an annual savings of 22,400 metric tons of CO-2 emissions. The airline industry and the FAA should be leveraging the use of existing technology as much as possible to create airspace efficiencies and reduce aviation's impact on the environment. That really is the mission of NextGen.

Alaska Airlines is proud to continue our history of technological innovation in our use of RNP at Sea-Tac. We look forward to replicating the benefits of this project for all equipped users at airports across the country.

Mr. Chairman, that concludes my oral testimony. I am pleased to answer any questions from the Committee.

Mr. COSTELLO. Captain Beck, thank you very much for your testimony.

Ms. Calvaresi Barr, I have a few questions for you. One, you stated in your written testimony that the FAA will need to implement a formal oversight program to ensure that third parties properly follow FAA design criteria and procedures for key areas. I wonder if you might elaborate on that statement.

Ms. CALVARESI BARR. Absolutely. I think we did hear clearly across the board that the role of the third parties is currently unclear, and while the vision for their use is on the development of public procedures as well as special procedures that would benefit specific carriers, we call into question how well thought out a business case that is and to what extent they will be used.

The first thing that has to happen to have a formalized oversight structure is you need to know who you are overseeing and what you are asking them to do. So my short answer to this is we need to step back, we need to rethink the role that the third parties will play. Then we have to recognize what it is we are asking them to do. We have to do an in-house assessment of our own capabilities and skill sets to oversee what we have been asking them to do. We need to have metrics in place to measure the ability to achieve the goals, and we need to do that on a continual basis.

And the final thing that I would add is if it is not achieving the larger vision, then we need to go back, rethink, and have a mitigation contingency plan in place to revision.

Mr. COSTELLO. You also expressed concerns about how special procedures may further complicate the workload for the air traffic controllers and increase the complexity of the national airspace. I wonder if you might elaborate on that as well.

Ms. CALVARESI BARR. Sure. I would be happy to.

I guess if I would put myself in the seat of a controller and I was dealing with a number of mixed capabilities and mixed procedures, the number one thing I would want to know is how big is that mix, what is that mix, what is coming at me, and what do I have to be aware of to do my job to ensure safe and efficient flights?

This is an issue. We need to understand what the new routes are going to be, what the new procedures are going to be, and who is equipped with what, and all the players and stakeholders, including the controllers, need to be aware of that. They also then need to be properly trained to handle the uniqueness of these routes and these procedures, and they have to have the tools to do so.

Mr. COSTELLO. Thank you. Mr. Brantley, you indicated in your testimony, you talk about how the FAA must have a strategic approach to deploying RNAV and RNP. I wondered if you might elaborate on what you think that this strategic plan should look like.

Mr. BRANTLEY. Thank you, Mr. Chairman. Yes, I believe, as was just stated, part of the difficulty with everyone coming to grips

with this or getting on the same page is differences over what priorities there may be, how new procedures will fit into the overall system, and right now I don't believe the agency has a comprehensive plan that stakeholders have bought into that they have been part of. I think everyone needs to understand what the priorities are for the overall NAS and then develop a plan on how to get there. Everyone can't just be in a rush, and that is where we have concern with the best equipped, best served philosophy.

It sounds good, but that doesn't necessarily take the agency where it needs to go. If everything could transition overnight, that is one thing. But since it is going to be a phased evolution it has to be done in a logical, thoughtful manner in a way that best suits the needs of the overall NAS and the flying public.

So that may cause conflict with different constituents' priorities, but I think that has to be grappled with and a plan has to be developed to address that as much as possible.

Mr. COSTELLO. Thank you. Captain Martin, you say that the FAA must apply useful RNP procedures, starting with the Nation's 35 busiest airports. In your opinion, what is the biggest hurdle that the FAA faces in deploying useful procedures?

Mr. MARTIN. First, let me define ″useful.″ We define ″useful″ at Southwest Airlines as a safe approach, an efficient approach, and an accessible approach. We agree with the FAA's OEP roll-out plan. We have done a cross inventory against the roadmap. And if the FAA meets their plan for deployment, that meets our return on investment. So we completely support the FAA's OEP plan roll-out. But our definition of ″useful″ is any procedure that we define as safe, efficient, carbon negative, and accessible, sir.

Mr. COSTELLO. Very good. The Chair now recognizes the Ranking Member, Mr. Petri.

Mr. PETRI. Thank you very much. I appreciate the effort that went into each of your statements, and the complete statements of course are part of the record. I wonder—there is one area that was a theme in many of your remarks, and that is that there seems to be something of a chokepoint in going through the environmental clearance procedures for these variable, more efficient routes into airports. And I sit here listening and think to myself, well, if you had an environmental impact requirement on the rule here, these more efficient routes save time, fuel, reduce emissions overall. So is the rule that you are supposed to achieve environmental efficiency, is that causing overall environmental inefficiency. There is something wrong here with this procedure, because with more flexible routes and changes and having to approve all of them, it is delaying efficiency in the overall system and it is counterproductive.

Could you comment on that? And is there some way we can stand back and figure out a more efficient approach to achieve the legitimate goals of these environmental requirements, and really achieve them rather than saying we are meeting the formal requirement when in fact what we are doing is causing more pollution and use of fuel and all the rest of it? Who would care to comment? Maybe Mr. Fuller or——

Mr. FULLER. Yes, sir, I will start. If you think about the approval process and you think about rolling out what we think are thou-

sands of approaches that take into account aircraft performance in order to gain efficiency, we have to think about defining the process start to finish that can be achieved and repeated very quickly and robustly. The organizations responsible for approving the approaches have absolutely got to be engaged in the machine, in the factory that produces these approaches. And the environmental impact piece of it needs to be addressed—what I would consider rationally—against a balance of constraints. In other words, if 20 percent of your approaches are flying a ground track as described by a visual approach, we don't understand the need for reevaluating the environmental impact if they are roughly the same track over the ground.

Mr. PETRI. They take into account evidently noise and emissions right in that area, they don't take into account fuel savings, time savings, overall improvements to the environment that aren't related to those two factors. So it is kind of a weird thing. It pretends to be an environmental impact statement. It is really a not-in-my-backyard for people who live near airports requirement as best I can tell.

Mr. FULLER. It most definitely could be.

Mr. PETRI. Any other comments?

Mr. DAY. Yes, sir. First of all, we can't take shortcuts. And I think everybody agrees on safety and on our environmental responsibility. And our approach to date has been runway by runway. And what we propose moving forward is to look at the National Airspace System and that when we look at these areas, to look at an integrated approach to these performance-based procedures so that as we look at the impact on the environment, we are looking at adjacent airports and airspace, and we can show the overall effect or savings as far as fuel and noise and impact on the environment and on the communities.

So we believe that making the shift from looking at individual procedures, to looking more at regions and more of an integrated system in the communities, we can streamline the procedure and be good stewards of the environment at the same time.

Mr. COSTELLO. The Chair thanks the Ranking Member and now recognizes the gentlelady from Hawaii, Ms. Hirono.

Ms. HIRONO. Thank you, Mr. Chairman. We have been talking about NextGen for quite a while in this Committee, and I confess that just sometimes I get very confused as to what we are really talking about and today for the first time we are talking about something very concrete. So I thank all of the panelists.

I am curious to know—I commend Southwest and Alaska for taking the lead. I am wondering why it is that the other airlines such as United, American, Northwest, why they have not proceeded to implement RNP since it saves money, fuel, lowers carbon footprint, efficiency? It sounds really good. Anybody care to opine? FAA person. Sorry. Mr. Day.

Mr. DAY. Certainly. It is tough times for the airlines and they do have to make difficult choices in this environment. I think everyone is committed and sees the value of these performance-based procedures and the larger NextGen system as we look at other capabilities and operational improvements. But they are oftentimes faced with very difficult decisions. We are absolutely delighted that

we have had such champions and early adopters as Alaska Airlines and American and Delta, and most recently, Southwest to be those leaders. And we do think from these measurable benefits that Dr. Sinha described, we will excite and show the business case for making an investment in this capability for these airlines.

Ms. HIRONO. Are some of the other—did you want to say something?

Ms. CALVARESI BARR. I would just also like to add that in order to invest that kind of money in the types of avionics that these carriers will be required to put on their aircraft, they have to be assured at some point that the routes and the airspace have been aligned in order to maximize those benefits. So if I was buying a system, I would want to make sure that I have an environment in which that system would be able to return its investment, and right now I think with what we have learned, the vision that FAA has currently on the books is just overlays of what was the traditional ground-based radar system.

Ms. CALVARESI BARR. I am very encouraged to hear Mr. Day say that they are taking a step back and they are thinking about ways to maximize the airspace. I think once that is done, you may see other carriers willing to step up and say now it is time to put that kind of money into those high-cost avionics because I think I can realize the benefits.

Ms. HIRONO. I think that makes a lot of sense to me.

Mr. Day, sir, does FAA have some kind of a time frame in which they can put in place the kind of procedures and basically, I guess, procedures so that other airlines can make these kinds of decisions moving forward.

Mr. DAY. Yes, ma'am. So first of all, we have been on track with our Flight Plan and also from the recommendations from the performance-based aviation rulemaking committee to deploy procedures. And from the community we are gathering an interest and a desire to really move out more quickly in putting out those procedures of value that have measurable benefits and solve real operational problems. So we have the NextGen Operations and Planning Office, and the Integration and Implementation Office, which is responsible for helping to integrate all of these operational improvements.

And as I mentioned before, we are making a shift from just production to looking at the National Airspace System in geographical areas, and when we go in there, looking at the airspace, the airports, including the satellite airports from the air transport airports, and taking a redesign of the airspace so that we really can provide the value and the benefit of having not only the vertical integrity of the performance aircraft——

Ms. HIRONO. My time is about to run out, so I am glad that you are taking a comprehensive approach.

But what kind of time frame are you talking about? I don't want to rush things. That is not what we are talking about. I understand the testimony that says we are not just wanting to have numbers here, we want to have qualitative improvements. So is there a time frame for you to put these in place so that more airlines can use this kind of system?

Mr. DAY. Yes, ma'am. We have a NextGen integration plan. In August, we will be getting the recommendation from the RTCA NextGen Midterm Implementation Task Force which has over 300 participants. And we expect them to make recommendations that are actionable for us to give that kind of clarity and focus to our steps moving forward.

Ms. HIRONO. Mr. Brantley, are you being consulted or are you at the table with the FAA in all these discussions and planning?

Mr. BRANTLEY. Not to date.

Ms. HIRONO. I think you should be.

Mr. BRANTLEY. I agree. We would love to be.

Mr. COSTELLO. The Chair thanks the gentlelady and now recognizes the gentlelady from Ohio, Mrs. Schmidt.

Mrs. SCHMIDT. Thank you. And I really appreciate Mr. Costello for holding this hearing.

Like many on this Subcommittee, I have spent a great deal of time looking at ways to stop the flight delays that we are seeing, and there are many causes. And I think one of the ways we can easily stop the delays is technology and NextGen. Everyone on this panel has opened my eyes to the potential and the problems.

I am going to focus my question to Mr. Fuller first, and anyone else that would like to answer, simply because Mr. Fuller represents my community. General Electric is in my community. The headquarters is just outside my district, but they test the engines in People's, Ohio, which is in my district. And it is very important, and I want to thank GE for all that they do to make my district as robust as it can be in these tough times.

So, two questions for you, Mr. Fuller. The first is: Do you have any suggestions on how the FAA might streamline the lengthy environmental review process for special RNP procedures?

And the second is, the RNP-equipped airline fleet has the potential to save an airline significant sums of money, reduce emissions, and contribute increasingly to the efficiency of our national airspace system. Has the FAA done enough to incentivize equipage for airlines? Two parts: speed it up, streamline it and incentivize the process.

Mr. FULLER. Just real quick on the environmental piece, I think, getting back to the thought that we need thousands of these approaches in a short amount of time frame. To my knowledge, the FAA—the United States infrastructure has never had this kind of step change over this short duration of time. All the aircraft that come out today, every 737 is RNP-capable if it has dual FMS. And so we are not going to wait for the airplanes to equip the airplanes will not be the delay.

So the machine that certifies the approach has got to be robust and it has got to operate just like every other machine that we would have in our facilities or our plants. It has got to take the procedures through a process quickly and expeditiously, and it has to find means of approving procedures on time schedules that would make sense and achieve the kind of goals that we are trying to achieve.

The second part of your question, you know, I think if you looked at what really has to happen, performance, the aircraft performance, the performance of each aircraft is what drives one approach

to be excellent and provide benefit or another approach to not provide any benefit at all. And so unless we create a system that allows the cooperation of industry and the cooperation of the approving authorities, we are not going to get to the approaches which take into account aircraft performance. All aircraft do not fly alike. And so the approaches that he wants are not necessarily going to be the approaches that are optimum for every other aircraft. But the efficiency gains for 737, A320 narrow body aircraft are enormous, and so we have to get to that point where we can deliver aircraft performance-based procedures.

Mrs. SCHMIDT. Does anyone else care to answer the two-part question? Or one part of it?

Mr. THOMANN. Ma'am, I would like to point out, in Ohio there is a company called NetJets.

Mrs. SCHMIDT. That is a pretty decent company. I like that company.

Mr. THOMANN. And we need to consider them as well, because the business aviation environment—NetJets is, what, 700 aircraft roughly? It is huge. And they have the same needs that we need in the commercial environment. And they certainly deal—we all deal in that same airspace. So we need these solutions not only for the commercial side but for the business and general aviation aircraft.

Mrs. SCHMIDT. I do have Lunken Airport in my district, which NetJets probably go into quite a bit.

Mr. THOMANN. Yes, ma'am.

Mr. COSTELLO. The Chair recognizes the gentlelady from California, Ms. Richardson.

Ms. RICHARDSON. Thank you, Mr. Chairman. Good morning.

Mr. Day, could you please share with this Committee to what degree the air traffic controllers have been involved in RNAV and RNP in terms of its creation and implementation?

Mr. DAY. As you know, the RNAV/RNP is a complex technology requiring a lot of sophisticated software and design characteristics. And so, while the overall design makes use of engineers, mathematicians and whatnot, when the rubber meets the road and we have to apply these procedures we need to engage our controllers.

For example, the National Air Traffic Controllers Association was invited and participated in the NextGen RTCA Task Force that was making recommendations in August and did a yeoman's job in helping us tackle some of those difficult issues, and we look for recommendations.

Likewise, while the design may occur in other offices, when we go to the facility for implementation, we do need the participation of the controllers in making sure that we solve some of these complex problems that have been described as far as fitting equipped and nonequipped aircraft into the operational environment safely. So they have participated in that area, as well as the task force, and we look forward to, as we get the recommendations out of the task force, their continued involvement.

Ms. RICHARDSON. On July 3rd, Secretary LaHood came to the Los Angeles International Airport and met with the air traffic controllers. And I don't believe, based upon what I heard in that meeting, I did not walk away with the impression that they felt they

were fully engaged. And I would venture to say that being more involved in a simple stakeholder and an occasional meeting probably wouldn't be sufficient. Although we have engineers who might deal with the mathematic aspects, it doesn't mean that an ongoing personal, up-close personal involvement throughout the entire process wouldn't be helpful. Would you agree with that?

Mr. DAY. I would agree that, as we do go to the location, it is essential that we have the operators directly involved in the implementation of these procedures.

Ms. RICHARDSON. Are they engaged right now in every step of the way of what you are doing?

Mr. DAY. I can't say that they are involved in every step of the way. I know that I certainly have engagement with different representatives from the workforce in this, and we do engage subject matter experts as we implement these procedures.

Ms. RICHARDSON. I would strongly recommend, if you would refer back to the staff with the Secretary based upon the meeting and what was said, and ensure that to whatever degree, because we don't want to reinvent the wheel, and it is far better to have people involved all along the way, consistently, as opposed to whenever you happen to show up at a particular location for them to assist in training or implementation.

Mr. DAY. I will take that IOU. And I was an air traffic controller so I do know how important it is to have them involved in the process.

Ms. RICHARDSON. Great.

Ms. Barr, based upon your testimony and the work that has been done so far, in your testimony you said that you would recommend that this Subcommittee in particular would keep its attention in regard to these two programs. What did you mean by that and what specifically are you asking us to do?

Ms. CALVARESI BARR. I think this is an excellent step right now, continued oversight with regards to how FAA is thinking about the strategy for RNAV and RNP. Clearly this is an enormous undertaking and task, but the benefits can just be tremendous. Based on what we know so far, we have raised a number of issues with regard to their implementation strategy, which has for the most part relied on an overlay of existing routes. That is not going to get us the benefits that can be realized by these two systems and clearly will not get us to what the NextGen goals are. So a continual look and focus on the vision and the implementation plan by FAA on that front is critical.

The second point that I would make is, given the discussion we have had thus far regarding the role of the third parties, if they are, in fact, needed for their expertise to develop these kinds of avionics and these kinds of routes, then the role has to be clear. All the stakeholders have to know what each other is supposed to do, and it has to be put together in an integrated and synchronized way.

So with that, I think much remains to be done. And I think keeping a watchful eye over it is a good thing. I can assure you the OIG has plans to continue to look at those two efforts overall.

Ms. RICHARDSON. Thank you so much and thank you, Southwest, for your participation. I yield back the balance of my time.

Mr. COSTELLO. The Chair thanks the gentlelady and now recognizes the distinguished gentleman from Alaska, the former Chairman of the Full Committee, Mr. Young.

Mr. YOUNG. I thank you, Mr. Chairman. It is always nice to be recognized as a former Chairman; but I will tell you it is nice to be the Chairman, Mr. Oberstar, it really is.

But Captain Beck, I am brave, I fly your airline a lot, Alaskan Airlines, and I think I know this answer. But I have two questions of you. How does the RNP benefit the residents of Juneau since you have instigated the RNP technology?

Mr. BECK. First of all thanks for your business. We appreciate it.

But secondly, we have had a number of saves and I define ″saves″ in my testimony; that is, a flight that would have been canceled or diverted if we had not had RNP. And for Juneau specifically, through June of this year we have had 338 saves. Last year we had 956. This goes all the way back to 2005. I believe we had about 550 saves that year. So every year, Juneau is about one-third to one-half of all of the saves that we experience with RNP.

Mr. YOUNG. Do you use that same system in any other place in Alaska?

Mr. BECK. Yes, sir. We have got RNP approaches at a number of cities. Cordova comes to mind, Ketchikan, Kodiak, Petersburg, Red Dog Mine, Sitka, and I believe Wrangle also.

Mr. YOUNG. Now when you have a save, literally how much does that save the airlines; do you have any idea?

Mr. BECK. Yes, sir. Last year it amounted to a little over $17 million in savings. Since 2005 through June 2009, the total amount of savings is $61 million.

Mr. YOUNG. So this is a case where the equipment, although expensive, can be paid for pretty rapidly because of the saves?

Mr. BECK. That is correct, sir. Our investment in RNP is somewhere around $35 million. That includes the equipage. The equipage is about $300,000 per aircraft, and it includes equipage and training of our flight crews so you can see the ROI on it has been very good for us.

Mr. YOUNG. Like I say, I feel very good that you have that equipment, because I used to fly into Juneau a lot and still do. And it is a little bit awesome, if my members have done this, because it is surrounded by mountains. I believe it is the safest airport now with this equipment that we have in the State, probably because before it was a little bit questionable. Now we get in there most of the time, and I just want to compliment the airlines for putting the equipment in and making it modern.

I would like to see this done across the Nation because I do believe in the long run it saves the pollution and it will take and make money for the airlines. And I yield back the balance.

Mr. COSTELLO. The Chair thanks the gentleman, and now recognizes the gentleman from Ohio, Mr. Bocceri.

Mr. BOCCERI. Thank you, Mr. Chairman. And I appreciate this discussion we are having today. It is very important we get this right.

To Mr. Day, current procedures, departure procedures, SIDs and the like, and instrument approaches into air fields are already

TERPSed, are already evaluated for performance-based procedures. I am not real clear on why there is such delay in putting weigh points through the RNF system overlaying existing routes or existing points that have already been TERPSed, already been evaluated for environmental conditions and the like. Can you explain to me what the delay is with respect to that?

Mr. DAY. I am not sure I understand the question. If it is just: is there a delay in production on overlaying the departure procedures over ground-based procedures?

Mr. BOCCERI. Yes. For ground-based NAVAID systems, we have the automarker, you have the funnel approach fix and the like. Why can't we just overlay our NAV positions, our NAV weigh points over top of these? Is there some sort of complication with technology with respect to that?

Mr. DAY. We can and we do. And I don't know of a specific issue that we have. Part ofthis is as you go to the more robust performance-based procedures, it requires certification of the air crew, the training program, the avionics, and then certainly flying and testing the procedure and validating it before it goes to publication. So there was just a normal cycle time to produce those, but they are not technologically difficult.

Mr. BOCCERI. So surely that if we have existing ground-based landing systems in ground-based NAVAIDs that had existing routes, that have already been tested for environmental, already have been performance-based on category of aircraft—A, B, C, D—that we could put overlay RNF points along them to save time. Or you are saying that is not a relatively complicated measure?

Mr. DAY. No, sir; it is not.

Mr. BOCCERI. Why hasn't the FAA implemented that if it is not very complicated?

Mr. DAY. I think in my remarks, I noted that we have published over 8,000 performance-based type of approaches; and the overlays, which were the priority early in the life cycle performance-based navigation routes, were where the focus was. It was on the overlays. And one of the things that we believe is important is to shift more towards where the greatest benefits are; and as other members on the panel have discussed, where we can change the route over the ground and cut miles short to really add additional value to the procedures.

Mr. BOCCERI. And I think that the airlines are talking about using these RNF procedures because they are very precise. They use NAVAIDs and INS systems to make this a very precise approach. Does the RNAV program that you have running right now—and RNP program—eliminate NextGen, eliminate ground-based NAVAID in the future, looking out into the future?

Mr. DAY. Looking out in the future, we do have to solve the issue of backup to make sure that we have the safety component covered. So, well down the road, because we do have a mixed equipage environment, which will depend on ground-based navigational capabilities for some time, as the equipage level comes up we would expect to see that we will be able to retire some of these ground-based assets, which we have already done in some cases. I think you mentioned the outer markers and/or the ADFs, you know, some of these

legacy navigational aids. So, yes, over time we will be able to retire some of those assets.

Mr. BOCCERI. I know most pilots love redundancy, and from the ″department of redundancy department,″ we should make certain that we have a backup, and ground-based NAVAIDs seem to be that route.

Speak to me, as my time wraps up here, about the IKO, in international—it seems as if Europe and some of our other friends who have much more compressed airspace than we have, have already implemented to sort of RNP procedures. Why is there such a delay with respect to what we are doing when we have much broader airspace than what they are doing?

Mr. DAY. For one, the airlines operate worldwide, and business aircraft as well, so we definitely want to harmonize internationally those procedures. And we have a number of standing Committees working with ICAO, CANSO, and other organizations and air navigation service providers to synchronize those efforts. And we are making very good progress in the area. Also in some air navigation service providers in country states, they mandate the equipage, so they could leap ahead in the development of those routes. But we are very closely harmonized, and I have a number of efforts going to harmonize those efforts with other air navigation service providers.

Mr. BOCCERI. I think we can be the leaders in this and not just followers in terms of what Europe is doing and what other countries are doing. It is important that we get this right. And I think we have to move with a sense of urgency, especially around our congested airports. To help save money, fuel efficiency and the like are very important to the airlines to keep them solvent. Thank you, Mr. Chairman.

Mr. COSTELLO. The Chair thanks the gentleman and now recognizes the gentleman from Tennessee, the former Chairman of this Subcommittee, Mr. Duncan.

Mr. DUNCAN. Well, thank you very much, Mr. Chairman.

Mr. Day, let me ask you this. In Vision 100 we had an environmental streamlining provision that allowed airports to help provide funding and even use AIP funds at times to hire additional staff to help speed up the NEPA or the environmental procedures and reviews. Has that provision been used very much, to your knowledge, or should it be expanded in any way?

Mr. DAY. I can't speculate on the expansion of the program. It has been a good program, particularly where we are putting down new runways and infrastructure in airports. It has been helpful to use some of those AIP funds to help fund the environmental aspects of those operations related to the new runways.

As you move out from the runways, certainly you get into the airspace where then it becomes the responsibility of others in the FAA and other budgets to work the environmental issues. So we work very closely with the Council on Environmental Quality in a lot of efforts to try and streamline the process. But at times, based again on ground tracks of aircraft, it can be a very lengthy and complicated process.

Mr. DUNCAN. Has the FAA made any estimate as to how many environmental assessments and full environmental impact state-

ments might be necessary to fully implement this program? In our briefing paper, it says you have got 2,000 to 4,000 development targets in the RNAV/RNP procedures, 800 to 1,200 RNAV and RNP routes; 1,000 to 2,000 RNP approaches; and then we get on over, several pages later, and it says it normally takes 12 to 18 months to do an environmental assessment, and it says that these environmental assessments are going to cost $250,000 to $1 million, and several millions of dollars for a full EIS. We have got another estimate saying that up to $5 million and as long as 8 years for one of these environmental studies.

And I just wonder, have you made any estimate or rough guess as to how much and how long all this might take?

Mr. DAY. I will have to take an IOU. I am not aware of those estimates. I will say, however, that the shift that we are making to step away from the legacy and look more towards an integrated approach to airspace design meeting up with performance-based procedures as well as integration with the airports themselves. We believe this will help improve the time and the efficiency and use of appropriated dollars to complete those environmental studies.

Mr. DUNCAN. Well, is the estimate of 800 to 1,200 routes, is that accurate? It is in a briefing paper we have.

Mr. DAY. Yes, sir. We believe that is accurate at this point in time. And we do believe that that may need to be modified once we get the recommendations from the RTCA Task Force.

Mr. DUNCAN. And would all of those require—or how many of those do you think would require full environmental reviews?

Mr. DAY. I can't speculate on what that number will be. Again, if we overlay existing routes, we can normally cover that with the existing environmental study and any Record of Decision relative to those operations. As we move away and put aircraft where they hadn't been before, sometimes depending on the numbers and the altitudes, the numbers of aircraft and the altitudes they fly, it could trigger anything from a categorical exclusion to an environmental assessment, all the way up to the most complex and expensive environmental impact study.

Mr. DUNCAN. All right. Thank you very much.

Mr. COSTELLO. The Chair thanks the gentleman and now recognizes the gentleman from New York, Mr. McMahon.

Mr. MCMAHON. Thank you, Mr. Chairman.

Mr. Day, in your response to my colleague from California, Ms. Richardson's, question about the air traffic controllers being part of the NextGen planning process, I was just reminded it seems that—I am from New York, Staten Island and Brooklyn, New York—and it seems that in the planning for the reconfiguration of the airspace there, the air traffic controllers were not consulted in that process.

Am I correct in that belief? And if so, how does that comport with what you said about the FAA working so closely with the air traffic controllers?

Mr. DAY. If you are referring to the New York/New Jersey/Philadelphia airspace redesign, that project has been going on for some time. And there was quite a bit of involvement, direct involvement with the line controllers during that time. There was a period where there was not as much involvement, although there were subject matter experts that were involved, and we continue to talk

with the representatives of the air traffic controllers and work towards more direct involvement in these airspace projects.

Mr. MCMAHON. So you will agree with me that that is something that should be achieved and they should be part of that process?

Mr. DAY. Yes, sir.

Mr. MCMAHON. As well as they should be NextGen. Thank you, I appreciate that.

Mr. Fuller, in your written testimony that had been submitted, you state that the advanced RNP technology is ″shovel ready,″ very important word to Congress and to America. And could you just—and it could begin being implemented today. Could you explain that more fully for us?

Mr. FULLER. Sure. Well the work that Alaska Airlines did back in the nineties was with the flight management system computers of GE Aviation. And the work that Southwest Airlines is doing, upgrading their airplanes, is with GE Aviation displays and flight management system computers. So new aircraft are all capable of RNP today, by and large, every narrow body and most of the larger business aviation airplanes. So we are ready. The airplanes are ready to go.

Mr. MCMAHON. A broad question. I am almost asking you to state the obvious, and I will ask if anyone on the panel—or as many as can at a time—what, in your opinion, could Congress be doing, what could we be doing to help speed up this processing to get the next NextGen up and running? I am not stating the obvious, but if you have any specific suggestions we would certainly appreciate it.

Mr. FULLER. Was that specifically for me sir?

Mr. MCMAHON. If you would start, and if you have some thoughts, I would be glad to hear them, Mr. Fuller.

Mr. FULLER. Sure. We continue to say that the airplanes have the capability and it is aircraft performance that counts the most; the vision of getting the FAA to realize that time is the critical next element in the vision, the narrowing the ellipse around the aircraft as it relates to its trajectory negotiation is critical in forming the system of the future.

So as we talk about accelerating the things that are important to us is that we collaboratively, the FAA, the manufacturers, the airlines, collaboratively and quickly demonstrate to ourselves that we can do this amongst a region with a little less challenge; that we take those learnings to a little more complex region. And we take those learnings to a little more complex region; but we continue to learn through the process, and we don't lose the opportunity to take those learnings from sector to sector to sector, because it is just absolutely critical that we take the two decades of learnings that Alaska has and the 6 or 7 years that the Southwest has been working on this and start pushing those into other airlines in other regions.

Mr. BECK. Sir, if I may comment. I think we really need two things. We need an expedited—and we know this is part of the obvious—expedited certification and operational procedures approval process. And secondly, we need a prioritized list of where these procedures provide the most bang for our buck.

Mr. MARTIN. Sir, I would like to add also from Southwest Airlines, as we move through this project I believe defining environmental as carbon in addition to just noise. Our business case was also built on fuel reduction and carbon savings. And then also establishing the metric; how will we know if we succeeded? We can do overlays, we can do special procedures, we can do public procedures; but how do we know if we have succeeded; what is the metric?

Mr. BRANTLEY. I will try to be brief. I think doing what you have done today, providing oversight, bringing the issues to light, is very helpful. And I think continuing to do that will be great because so many things have come up today that I believe have to be addressed.

One of the things I have heard a lot is trying to speed up—whether it is the review process, the approval process—development. Those are all great things if it is necessary. I think without knowing how many procedures are needed, where they are needed, when, who is going to benefit, which ones do need environmental reviews, without knowing the answers to all that it is hard to say that anything has to go quicker, or if it has to go more quickly what needs to be done to expedite it.

I think that the FAA really has to get their arms around the priorities and what is doable. We know we can't implement this all at once, so at some point the agency has to decide who is first, and when, and lay that out for everyone.

Ms. CALVARESI BARR. Yes, I would also just like to comment. I think ″oversight″ is an operative word, but here is what I would add to that. These are the things I would want to oversee.

I would want to oversee that FAA is moving from the old ground-based system to the new one and the benefits that can be achieved. I would want to make sure that they have an integrative plan that aligns and synchronizes RNAV/RNP with airspace redesign, with ground infrastructure improvements, and new avionics, and that their policies and procedures are updated to reflect that. Also, that the controllers and pilots are trained and that there is an oversight strategy. That is the business model. There is a lot within that.

Third, I would say we need to clarify the role of FAA and then the role, alternatively, of third parties. And, finally, someone needs to figure out what type of incentive structure we need to equip the aircraft with the avionics they will need to maximize the benefits.

Mr. MCMAHON. Thank you. I see my time is up. I thank you, Mr. Chairman.

Mr. COSTELLO. The Chair thanks the gentleman.

To clarify a point, Mr. Fuller, you indicated that the newer aircraft have the equipage. How new? How far back do we go?

Mr. FULLER. Right now the standard 737 coming off the line, if it is equipped with dual FMSs, RNP, .1 out of the box, and the A320 is also RNP, .15, then capable of .1 as well. So all the narrow bodies that are being delivered today are capable of RNP. And then a good number of the large business aircraft are capable as well.

Mr. COSTELLO. And how long has that been the case? How far back?

Mr. FULLER. I don't know. I might refer that question to Captain Martin or Captain Beck.

Mr. MARTIN. Yes, sir I can help you with that. Just as a breakdown of our fleet all of the 737 NGs, airplanes we have probably taken delivery of in the last 7 to 10 years, are RNP-capable. Two hundred of our airplanes we refer to as the classics require the modifications. So it is safe to say any airplanes that have rolled off in the last 7 to 10 years, dual-FMS-equipped will be RNP, .10.

Mr. COSTELLO. Thank you. The Chair now recognizes the gentleman from Pennsylvania, Mr. Dent.

Mr. DENT. Thank you, Mr. Chairman.

Mr. Day, good morning. I have a few questions for you. For months the FAA has touted its best-equipped, best-served policy promising more efficient routing for airlines who invest in the NextGen technologies. How will the FAA implement this policy?

Mr. DAY. Thank you, sir. The best-equipped, best-served is really a notion that we actually have today. If you are equipped with a Category 2 or Category 3 ILS capability, you have access to an airport that others not equipped don't have. Likewise, when we implement the Mode C Veil rule, we, for safety reasons, require transponders with altitude and reporting.

So taking those types of policies and applications, we realize the best-equipped, best served does not mean necessarily best-equipped, first-served. It does mean that we create the opportunities, certainly in high density areas, where we can provide a service for the profile in the trajectory the aircraft wants to fly, so that they can make utilization of their investment. It is complicated, and it is going to take a lot of industry involvement from many people to figure out in an applied fashion how we can introduce that type of policy in some of these areas where we want to take advantage of the equipment on the aircraft.

Mr. DENT. Can I also ask you what is the FAA's estimate for the cost of training the air traffic controllers to handle the larger volumes of the RNP-equipped air traffic. I want to know what your estimate is for the cost of training air traffic controllers to handle larger volumes for the RNP-equipped air traffic.

Mr. DAY. I don't have a cost estimate for that. We can get some feedback.

Mr. DENT. The Committee would like to have that information. Thank you very much.

[The information follows:]

FAA insert for the record, page 69, line 1517:

In FY2010, we expect to do at least 150 Performance-Based Navigation (PBN) procedures. Each will require an environmental review to determine if it is eligible for a categorical exclusion (CATEX), or if more detailed environmental analysis is required. As PBN implementation moves away from overlays of current procedures and traffic flows, in order to gain increased fuel savings and other system efficiencies, the majority of future implementations likely will require environmental impact studies (EIS) or environmental assessments (EA) rather than qualify for environmental categorical exclusions (CATEX).

We estimate that by 2015, at least six EISs will have been completed for PBN implementation in large/complex terminal airspaces. Each EIS costs an average of $1 million, for a total of $6 million for all six studies, and takes, on average three years to complete. For EAs, we expect at least eight will be completed by 2016, with 50 more completed through 2025. Each EA costs an average of $500,000 and takes a minimum of 12-18 months to complete. The eight EAs to be completed by 2016 will costs $4 million, and using these current costs, the additional 50 will cost $25 million by 2025.

Mr. DENT. And how have air traffic controllers, how are they accommodating each special RNP procedure designed for individual air carriers; for example, the special procedures written for Alaska Airlines?

Mr. DAY. One of the challenges on moving to a performance-based environment is the mixed equipage and the different profiles that the aircraft will fly. We have trained the controllers on what these profiles look like. There still is a lot of complexity and cognitive challenges for our controllers, and we are working to get them some tools that will help them space these aircraft, and early, very early, identify any deviation from course or altitude so that they can do an intervention to keep it safe. It is part of the integration of these procedures into the existing system that is a major challenge of implementing NextGen and where we are putting a lot of effort.

Mr. DENT. Also in your testimony, you noted that harmonization with the international community is important. What are some of the most pressing concerns that must be addressed with the international community as the RNP and the RNAV procedures are being implemented?

Mr. DAY. Well, building the consensus is certainly one of them. And one of the things we have heard from the operators and the manufacturers is they do not want to put double and triple equipment for the region of the world that they fly in. So that harmonization is important, to identify at a high level and get agreement on what the requirements are for aircraft, either retrofit or forward-fit, so they can operate worldwide. And we are making some good progress on that and continue to make that a priority.

Mr. DENT. And Ms. Barr, my question to you is: Some have counted the RNAV and RNP among the low-hanging fruit for near-term realization of NextGen benefits. Do you think that characterization is accurate?

Ms. CALVARESI BARR. I actually don't. In my statement I refer to those two systems as sort of the legs to the table. And our understanding is that these two programs, RNAV and RNP, represent, out of all the operational capabilities that will be needed for NextGen, 50 percent of that. So I would say that they are not low-hanging fruit.

This is an opportunity to redesign our airspace, to take greater advantage of it, to have more precision in our flying, to achieve a whole bunch of efficiencies. And my understanding is that is, in large part, the vision for NextGen. So these are major components.

Mr. DENT. Thank you, and I yield back the time.

Mr. COSTELLO. The Chair thanks the gentleman and now recognizes the distinguished Chairman of the Full Committee, Chairman Oberstar.

Mr. OBERSTAR. Thank you, Mr. Chairman, and Mr. Petri, and Committee staff for the splendid work in preparing for this hearing and for your continued vigilance, Mr. Chairman, on these matters of aviation technology.

The testimony is both edifying and—well, it is edifying at the same time it raises a number of questions. And I think, Ms. Calvaresi Barr, you raised the most important issue. It is a ques-

tion I had prepared for myself to ask, but you sort of laid the ground work for it.

And that question, Mr. Day, is has your office—have the FAA created a progression graph showing where each of these technologies fits in, moving from current NAVAIDs through RNAV/RNP into whatever other elements there are of NextGen and how each fits with the other and how they fit into the grand plan? Or are you just doing step at a time without any overall all-encompassing scheme?

Mr. DAY. Thank you for the question, Mr. Chairman. And, yes, we are, in the design of NextGen, which has a number of solution sets, which I think you have been briefed on, where we take the readiness level of the aircraft and apply the performance-based navigation capabilities along with the automation to support those, along with capabilities like Automatic Dependent Surveillance as a surveillance source and DataCom for decreasing voice communications and getting more of an Internet-type of connection with the cockpit to transfer the information that is needed.

These are laid out in our NextGen Implementation Plan, and that is led by Vicki Cox, our senior vice president of NextGen and Operations Planning, and we work with her office to integrate these and approach these plans.

Mr. OBERSTAR. Do you have a graph that you could submit to the Committee for our review of how each of these steps, each of these new technology initiatives fits in, lays the ground work for, is a stepping stone toward the next level, and the cost both for air carriers and for FAA, and where this is going over the next 15 years? You have a 15-year projection plan for NextGen? I know you have repeatedly—FAA told this Committee it is going to take that long.

And I ask that because over my years, 25 or so overseeing aviation, we have gone from one technology to another. This one is going to be the stepping stone to the next piece, and the next one is going to be interoperable and it is going to be interchangeable. And what we are dealing with is piecemeal progression, not within a comprehensive overall plan, so that we really know where one piece fits into the next.

And I give FAA enormous credit, which it doesn't receive in the secular press. The aviation press, to put it in broadest terms, does a good job of following these. But since 1985, if my numbers are about right, FAA has installed 65,000 pieces of technology to improve safety, improve navigation, improve workload of controllers, improve the— make easier the work of pilots and air traffic controllers and professional air systems specialists and so on.

But we turned a corner in all of that. We have gone through the AAF, advanced automation system. We have gone through the new STARS TRACON technology, we have gone through the end route technology, and probably pushed those technologies about as far as they can go. Now we are into satellite-based navigation technology, and it is going to take a much greater level of coordination than ever before, much greater control of costs. So I would like you to answer that inquiry.

Mr. DAY. Thank you, Chairman, and we will get that information for you. And we have been criticized before for lining up programs in a very linear fashion. And that is one of the reasons why we de-

veloped our Enterprise Architecture with clear milestones and have an Integration Implementation Office to make sure that these system-of-systems that we are deploying are synchronized and are aligned and executed well, using the taxpayers' dollars and including a lot of stakeholder involvement. But we will certainly go back and give you a very detailed description of that.

Mr. OBERSTAR. I think the Committee would benefit from this.

[The information follows:]

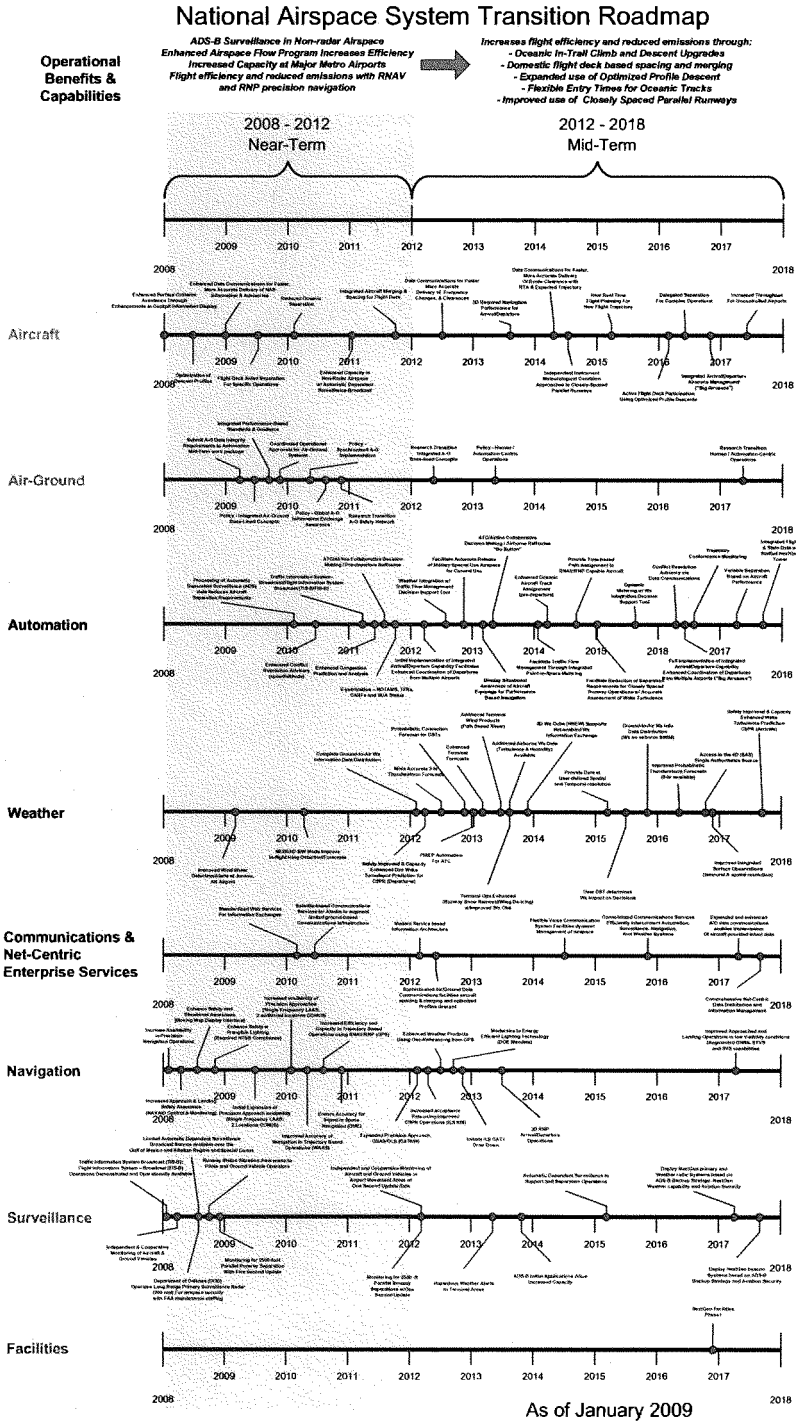
FAA insert for the record at p. 76, line 1701:

The following estimates outline the cost of training air traffic controllers on Area Navigation/Required Navigation Performance (RNAV/RNP) procedures. The current estimated training cost for all ATC facilities that use RNAV/RNP procedures is $352,487 per year. The FAA Air Traffic Control Academy invests approximately $50,000 at present for related instruction.

At the FAA Academy, students receive approximately four hours of instruction in academics for general IFR procedures, which include RNAV/RNP procedures. The cost estimate for a four (4) hour, instructor-led lesson in a classroom environment is approximately $50,000. As FAA integrates new training requirements into all aspects of controller training at the Academy, including laboratory training exercises for en route, tower cab, and terminal radar courses, additional costs will be incurred.

The estimated cost for training air traffic controllers in En Route ATC facilities, based on an estimated 30 minutes of training per controller per year; 6525 controllers at an estimated $59/hour is $192,487.50.

The estimated cost for training air traffic controllers in Terminal ATC facilities that use RNAV/RNP procedures is based on estimating one (1) hour of training per controller per year; 3200 controllers (those currently working with RNAV/RNP procedures, out of a total terminal controller workforce of approximately 8800, or approximately 36% of the Terminal controller work force) at an estimated $50/hour is $160,000.


National Airspace System Transition Roadmap
Operational Benefits & Capabilities
ADS-B Surveillance in Non-radar Airspace
Enhanced Airspace Flow Program Increases Efficiency
Increased Capacity at Major Metro Airports
Flight efficiency and reduced emissions with RNAV and RNP precision navigation
Increases flight efficiency and reduced emissions through:
- Oceanic In-Trail Climb and Descent Upgrades
- Domestic flight deck based spacing and merging
- Expanded use of Optimized Profile Descent
- Flexible Entry Times for Oceanic Tracks
- Improved use of Closely Spaced Parallel Runways
2008 - 2012
Near-Term
2012 - 2018
Mid-Term
2009
2010
2011
2012
2013
2014
2015
2016
2017
2008
2018
Aircraft
Air-Ground
Automation
Weather
Communications & Net-Centric Enterprise Services
Navigation
Surveillance
Facilities
As of January 2009

Mr. OBERSTAR. And other Members have asked the question of engaging the air traffic controllers and the professional air system specialists in the design and development of these new technologies. And you have indicated—but I want to get a more clear statement from you—yes, we are engaging controllers, professional air system specialists as we develop these technologies.

Mr. DAY. I think one of the major commitments that the Administrator made, and the Secretary, is to get more line involvement in these types of technologies, and we are committed to improving those relationships and that involvement from our subject matter experts.

Mr. OBERSTAR. As STARS was being developed—and goodness knows, I went to Raytheon, I went to Lockheed Martin and others who were—Lockheed was developing their famous Ollie competitor system. And each time I did, I found, well, they are going back and redesigning this, because after the engineers at FAA—the engineers who were implementing FAA specs at the contractor level—presented their ideas to the controllers, they thought, Oh, there are major things that we didn't anticipate, we didn't ask them about, such as the fixed trackball; it is over here for right-handed air traffic controllers; well, what about lefties? We are going to have to reach all the way across. So that led to the moveable trackball.

Simple things could have avoided hundreds of thousands of dollars of redesign if you just brought them in earlier in the process. It isn't a matter of, oh, we want to feel good and ask their input after we have designed it. You need to engage them. They are the practitioners.

What benefits do you anticipate for the most complex airspace from RNP? Like the new New York TRACON, like the Southern California TRACON? The Southern California TRACON handles, for those who don't really know why I am asking the question—I suppose most of the people in the audience do—but it handles more air traffic than all of Europe combined. And so does the New York TRACON. It handles navigation for 45 airports. That is 2-1/2 million operations a year, those two alone. We have, what, 30 million operations a year handled by TRACONs, and that is more than 10 percent of the whole operation in those two TRACONS. How are they going to benefit? What do you anticipate?

Mr. DAY. First of all——

Mr. COSTELLO. And my next question is: How does this fit into the east coast design?

Mr. DAY. Thank you for the question, sir. And the real exciting part about this is we are moving from that hard-wired, ground-based, point-to-point, not scaleable system, to one that is network centric, very flexible and agile in fitting the task to the design.

And the exciting part of this is that by using technologies like performance-based navigation, particularly the highest type, the RNP/SAAAR types of capabilities, we are able to take the airspace and the approaches and departure and segregate them, both the major air carrier port from the satellite airports and the routes that they fly. So particularly where we have legacy airports that are land-constrained and we can't add any more runways, we will be able to take what I call those tightly coupled interdependent op-

erations and segregate them by the performance of avionics on the aircraft. And then, of course, we will need the automation systems.

But that is where the tremendous value is here with these advanced capabilities is: to untangle the old legacy system. But it does require automation. It does require airspace design, and it is going to need the involvement of a lot of stakeholders, operators as well as controllers and technicians, to make this work.

Mr. OBERSTAR. I would estimate the FAA has spent something like 10- to $15 million on the several east coast airspace redesigns, each one shelved because some other group said, oh, no, we are going to be impacted by the noise or we don't like these approaches or something else has come up in the meantime.

So, I want to get back to my question: What benefits are there going to be for, say, the New York TRACON? How is this going to make their—how is RNAV going to make their job better? RNP, excuse me.

Mr. DAY. One is the confidence of the precision of the approach or the procedure being flown. Right now there are a lot of touch points. As you mentioned, the New York TRACON interfaces with all the adjacent towers in the centers, and technology is no longer the limiter on the performance of the system.

So as we converge the technology with the automation equipment, we will be able to give them very good situational awareness, very good tools to help them know precisely where the aircraft will be, and will alert them when they are out of conformance. So I think they will be very excited and see a lot of benefit in these tools because their business is providing a service. And they care about that. They want to provide the best service. And with these tools we believe the RNP as well as all the other capabilities that we envision——

Mr. OBERSTAR. That is a good step in the right direction. It is not a test and I am not challenging you, I am just trying to unfold the pieces of this system. Is the software going to have to be changed in the TRACONs? Are the screens going to have to be changed as part of this? Is this going to require some additional hardware and software cost investments?

Mr. DAY. We know the life cycle of the equipment that is out there, and we have road maps from surveillance as well as navigation and automation, and even facilities that we see in the future that we are going to have to make design changes. But that will likely involve a number of changes from displays, increased use of colors, and different alerting, some new tools to help them sequence and separate aircraft, so there will be a lot of change over time. But the good news is it will be organized, not program by program, but really more as a portfolio and an integrated approach to making these very needed changes in the system, but doing it in an orderly and organized way.

Mr. OBERSTAR. There has apparently been a success in Alaska. Alaska Airlines says they like these changes; it saved them. Southwest. Southwest likes the changes. But you have had experience, so in those airspace—up in those airspaces, if you will, what have been the technology or equipment changes required?

Mr. DAY. In Alaska, for example, we were able through the Capstone project to put displays in the cockpit so that they would have situational awareness of other aircraft in their vicinity, so——

Mr. OBERSTAR. Both on the flight deck and at the controller level.

Mr. DAY. Yes, sir. At the Anchorage Air Traffic Control Center, we are able to surveil and separate aircraft using ADS-B targets with the radar targets up in the Bethel area. So we have been able to—where they didn't have that type of safety and service before—at least in the demonstration project, to prove that we could use these technologies to provide that safety and service.

And as the gentleman from Alaska Air mentioned, we have been able to have just an awful lot of saves, and safety as well as good service, for the citizens of Alaska into Juneau.

Mr. COSTELLO. Will general aviation, not corporate aviation, but will piston engine, general aviation aircraft benefit, be able to use RNP?

Mr. DAY. Yes, sir. And they are using it now. There is an expense, and so not everyone, all facets of general aviation——

Mr. OBERSTAR. King Air. What would a King Air have to do?

Mr. DAY. Many of them are equipping now with some of the advanced avionics. Certainly RNAV equipment. There is more expense involved as you go to the higher levels like RNP, and they may not need it, dependent on their——

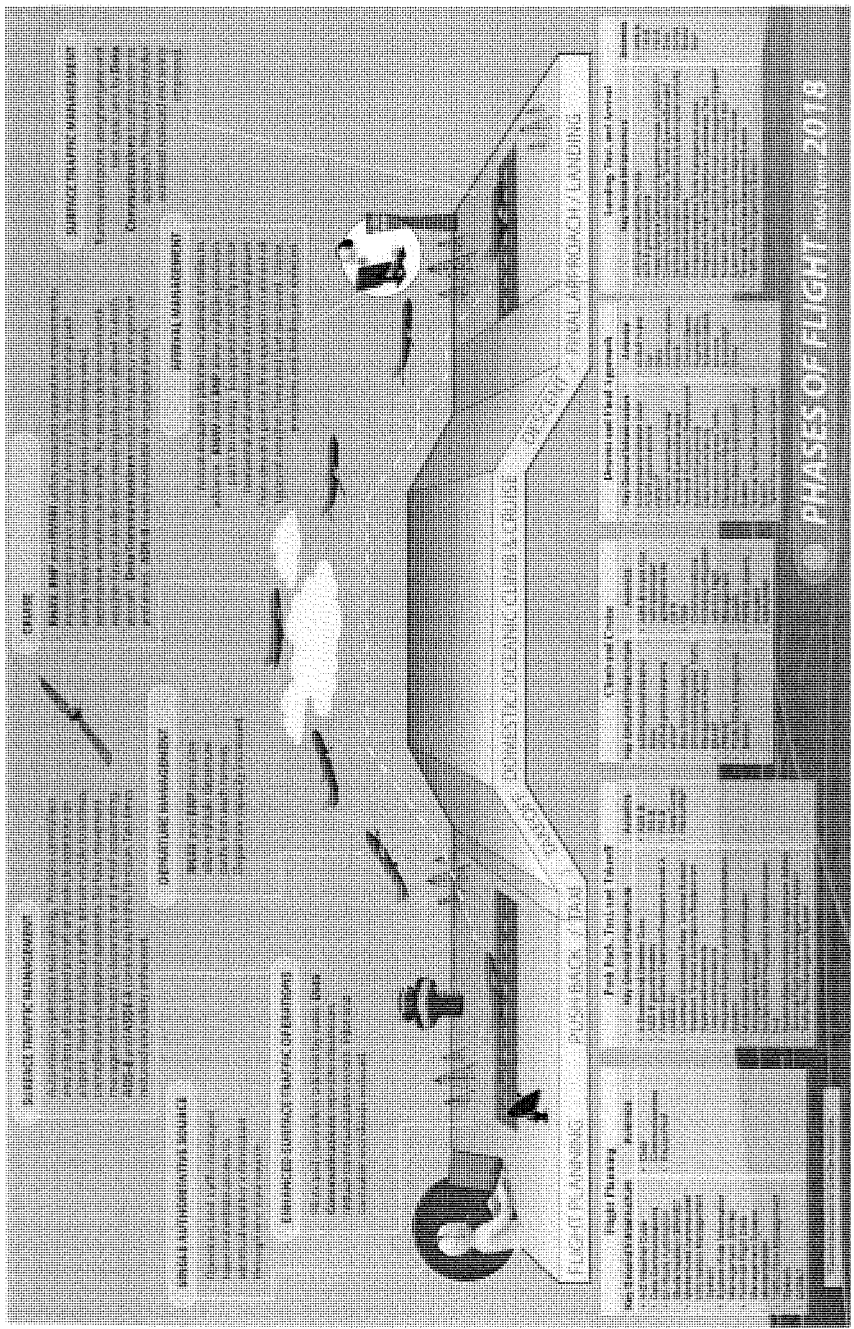
Mr. OBERSTAR. They wouldn't need it flying into a noncommercial airport. But in flying into one of the 429 commercial major airports in the country, you certainly want to be—if they want to fly in that airspace they will want to use that technology. What would it cost to equip a King Air or Queen Air to use that technology?

Mr. DAY. I don't have it off the top of my head but I know we do have those estimates for different states of equipage, whether it be from the low end to the very high end, or also whether it is a retrofit or a forward-fit for those aircraft. We can get that for you.

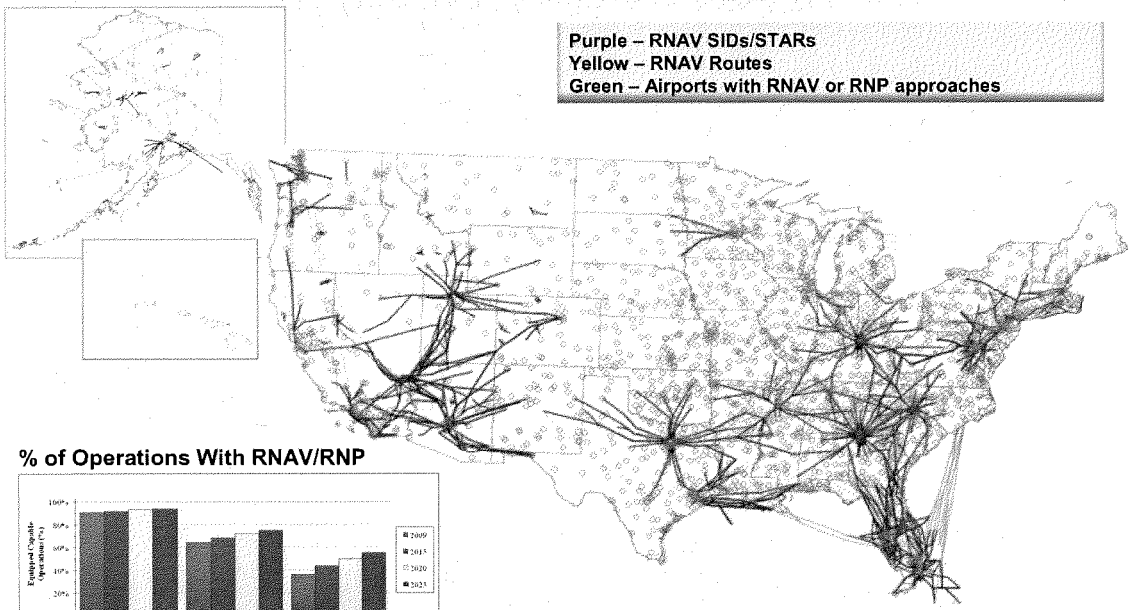
[The information follows:]

FAA insert for the record at p. 89, line 1989:

For the population of general aviation aircraft with fewer on-board systems, $20,000 is a typical cost to purchase and install equipment for RNAV capability.


PHASES OF FLIGHT
2018

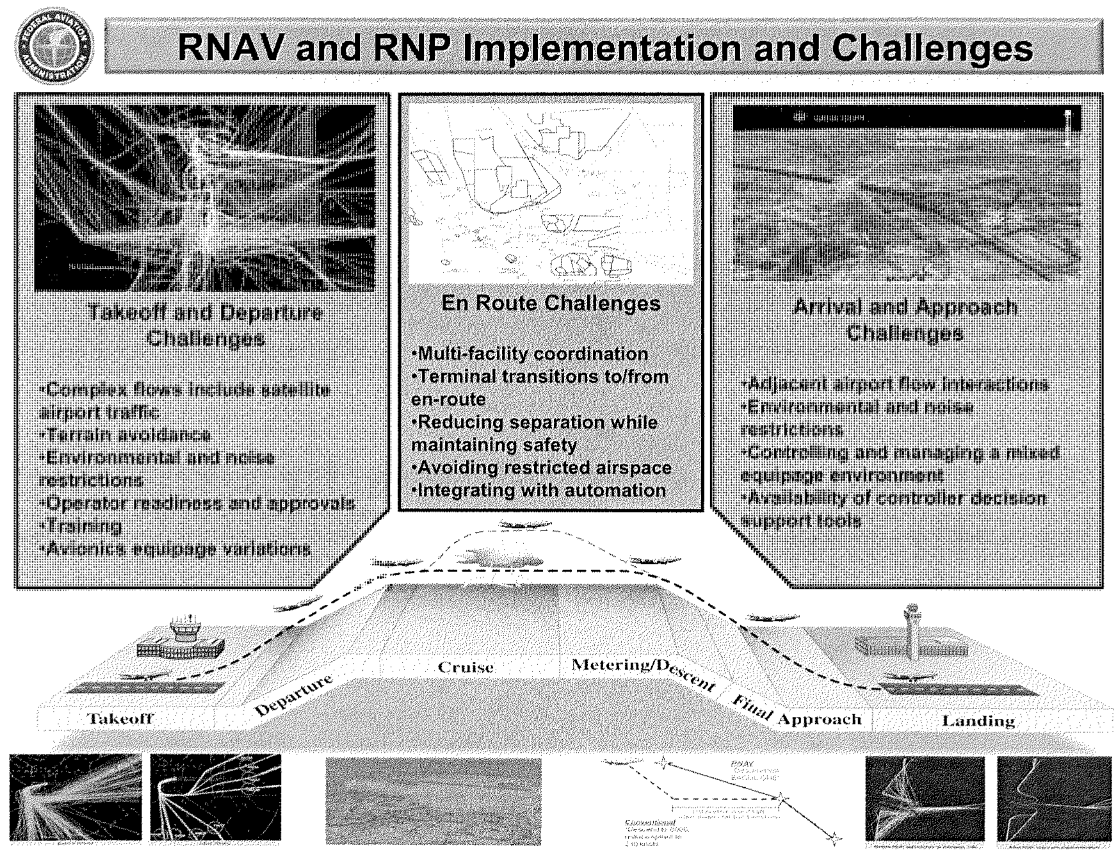
RNAV and RNP Implementation in the National Airspace System



% of Operations With RNAV/RNP

Current FAA Approved RNP SAAAR Operators

Continental Airlines · Honeywell · jetBlue Airways · NetJets · Alaska Airlines · AmericanAirlines · Boeing · Delta · Horizon Air · Johnson & Johnson · verizon


RNAV and RNP Implementation and Challenges
Takeoff and Departure Challenges
•Complex flows include satellite airport traffic
•Terrain avoidance
•Environmental and noise restrictions
•Operator readiness and approvals
•Training
•Avionics equipage variations
En Route Challenges
•Multi-facility coordination
•Terminal transitions to/from en-route
•Reducing separation while maintaining safety
•Avoiding restricted airspace
•Integrating with automation
Arrival and Approach Challenges
•Adjacent airport flow interactions
•Environmental and noise restrictions
•Controlling and managing a mixed equipage environment
•Availability of controller decision support tools
Takeoff
Departure
Cruise
Metering/Descent
Final Approach
Landing

Mr. OBERSTAR. We have probably 100,000 of those types of aircraft that use the commercial airspace, and it is of importance. And when I have to travel around my district, and need to go from the Canadian border, International Falls to Minneapolis/Saint Paul, and there isn't Northwest Airlines service, I have to charter. And I want to know that my charter operator is going to be able to—and I hear this from other Members as well. It is a general question so it would be useful to have that.

Mr. Thomann, will Jefferson/Boeing—it is so sad that Jefferson disappeared on its own. Such a great name in aviation. It was swallowed up by Boeing. But at any rate——

Mr. THOMANN. We are privileged.

Mr. OBERSTAR. Good answer. I am sort of a nostalgist. Some of these things it would be nice to be left alone. But at any rate, will you continue to produce hard-copy charts, or will this remarkable progress in technology succumb to simply changing the software on the computers on board aircraft?

Mr. THOMANN. It will be both. So we are continuing in this digital transformation. As you know, it is a 75-year-old company, with good old Captain Jeff, started drawing those charts on that little black book. We are still drawing those charts. In fact, we print about a billion of them. And that is down from about 2.2 bil.

As we get new technologies and the general aviation aircraft—which, by the way, are capable of flying RNP—and they use them in smaller airports or, like, going into Eagle, Colorado, where it is very terrain-challenged, RNP allows an airplane to get in there, where normally it would take a 1,200 AGL above the ground for this person's minimum with 4 miles visibility. With RNP, you are pushing it down to 400 feet, a mile and a quarter. So it allows these aircraft also to participate.

To answer your question, sir, we are going to continue to print the paper charts until we can get a total digital transformation, which is our end goal.

Mr. OBERSTAR. All the Digital Age is wonderful. I do not demean it in anyway. And I love seeing those pilots with stacks of charts this thick. And I worry when they come on board with something this size that will have 1,200 charts in it and something blows a fuse.

Mr. THOMANN. So you can get our charts that way now, sir.

Mr. OBERSTAR. I know. And then there is going to be the day, as happened to me, when the pilot turns to me and says, Is that White Iron Lake down there? And I say, It sure is. And he says, I have never flown up here before, I wasn't sure.

So, yes, I am not a Luddite. I think these are great. But when they fail, then you are really out of luck.

Mr. THOMANN. They can be—and there is enough redundancy, and I am a pilot with a pacifier myself, sir. So when I fly a little Cirrus, it has all the avionics that I could possibly ask for and the electronic charts. But I still have my pacifier in the left seat, which is a paper chart.

Mr. OBERSTAR. That is a good idea.

Thank you, Mr. Chairman, for being vigilant. I thank our staff for their splendid work on this complex matter. And we will continue to revisit, and we ask the IG to continue your vigorous over-

sight, and thank Southwest and Alaska for real-world participation.

Mr. COSTELLO. The Chair thanks you, Chairman Oberstar.

And do other Members have questions? If not, let me assure you and the IG's Office, Ms. Calvaresi-Barr, that we will continue to provide vigilant oversight at the Subcommittee level.

As you know, we have had a number of hearings on NextGen. We will continue. And we have had roundtables too, not just formal hearings, but we have sat down informally with not only folks from the FAA but the inspector general's office and others in the industry to get updates, reports, and try and stay abreast as to what progress or the lack of progress is being made.

So I think some very good points were made this morning. We appreciate all of your testimony. And this concludes the hearing today. And the Subcommittee will stand adjourned. Thank you.

[Whereupon, at 12:01 p.m., the Subcommittee was adjourned.]

STATEMENT OF
THE HONORABLE JERRY F. COSTELLO
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA AVIGATION (RNAV) AND REQUIRED NAVIGATION PERFORMANCE (RNP)"
JULY 29, 2009

- I welcome everyone to the Aviation Subcommittee hearing on "NextGen: Area Navigation and Required Navigation Performance." The deployment of RNAV and RNP procedures are key near- to mid-term NextGen initiatives. RNAV and RNP procedures are part of the Federal Aviation Administration's (FAA) NextGen Implementation Plan, and are expected to be a major part of the NextGen Mid-Term Implementation Task Force's final report that is due next month.

- RNAV and RNP procedures utilize aircraft avionics to enable aircraft to fly shorter and direct routes that reduce fuel usage

and carbon emissions, increase flight capacity, and improve safety.

- RNAV and RNP procedures are in high-demand by the airlines, but the FAA faces challenges implementing these procedures. The airlines want direct routes into airports that will save more fuel, instead of overlays of existing ground-based navigational aids. However, the FAA will need to review future airspace changes and the environmental impacts of moving routes and procedures, which can take up to 8 years and cost $5 million per procedure.

- As the FAA implements new and more sophisticated routes, additional air traffic controller training will be required. However, the U.S. Department of Transportation Inspector

General's (DOT IG) office will testify that the FAA lacks extensive and up-to-date training programs to help controllers understand and manage RNAV and RNP aircraft, and that the FAA's training on new procedures consists of briefings rather than formal courses on RNAV and RNP. The DOT IG points out that the controller training issue is particularly important given the large number of developmental controllers in the system. I would like to hear from our FAA witness on how they will address the issues raised by the DOT IG's office.

- Given the importance of RNAV and RNP procedures to the industry, it is critical that the FAA articulate a clear strategic vision for how it intends to deploy these procedures. Looking forward, this Subcommittee will need to evaluate the FAA's strategy for deploying RNAV and RNP procedures

and to know if the FAA is meeting industry stakeholder expectations. Likewise, this Subcommittee will need to understand and evaluate stakeholder expectations and assess whether they can realistically be met given the implementation challenges facing the FAA.

- The Senate FAA reauthorization bill requires the FAA to develop a plan to deploy RNAV and RNP procedures at the top 35 airports by 2014, and throughout the entire national airspace system (NAS) by 2018. I believe the Senate's approach has merit, and that it should be given serious consideration in conference.

- In 2007, the FAA entered into agreements with two private "third-party" vendors to design and implement public RNP

procedures. It would be helpful to understand how the FAA plans to use third-party vendors and what role, if any, they are expected to play in NextGen. H.R. 915, the "FAA Reauthorization of 2009", requires the DOT IG to assess the FAA's ability to provide safety oversight to third-parties, and I look forward to hearing what the DOT IGs office has determined thus far.

- I also welcome our witness from Jeppesen (Jepp a sen), one of the two private vendors authorized to design and implement RNP public procedures. I would like to know what role Jeppesen believes it can play and what it can offer to the FAA and to airspace users.

- Some airlines believe that third-parties can help them obtain more desirable and efficient RNP routes, and might be willing to proactively finance aircraft equipage, pilot training and procedure development in order to obtain them. Southwest has committed $175 million dollars to equip its aircraft, train its pilots and hire a private vendor to design customized "special" procedures at the airports that it serves. Southwest has begun work at Dallas and Houston.

- Earlier this year, the FAA expressed concerns about the proprietary nature of Southwest's approach before this Subcommittee stating, "The primary concern we have is the proposed operations for the Dallas/Houston project are exclusive to Southwest Airlines, developed with proprietary criteria that may not conform to common flight tracks or other instrument operations at the affected airports."

- Moreover, the DOT IG's office will testify today that FAA officials have expressed additional concerns that other air carriers may follow Southwest and increasingly request customized special procedures at their airports. In turn, this could complicate the workload of air traffic controllers and increase the complexity of the NAS. While I understand that Southwest may have modified its approach, I would like to hear our witnesses elaborate on these concerns and discuss their potential implications.

- For its part, Southwest has expressed frustrations with environmental review process associated with deploying RNP procedures. Southwest believes that the environmental review process may hinder its ability to obtain more efficient routes. Without more efficient routes, the company may not

see the return needed to justify its investment. I would like to hear our witness from Southwest tell us what he thinks that Congress and the FAA can do.

- Before I recognize Mr. Petri for his opening statement, I ask unanimous consent to allow 2 weeks for all Members to revise and extend their remarks and to permit the submission of additional statements and materials by Members and witnesses. Without objection, so ordered.

The Honorable Michael E. McMahon
Statement
Aviation Subcommittee
Committee on Transportation and Infrastructure
NextGen: Area Navigation (RNAV)/ Required Navigation Performance (RNP)
July 29, 2009

Thank you Chairman Costello and Ranking Member Petri, both for your leadership on this issue and in addressing so many other important challenges for our aviation network.

We all know that our air system needs a major upgrade to secure the safety of the flying public and increase capacity. The planning for NexGen has been years in the making, but we need to make sure that we meet the critical benchmarks in the coming years to ensure a smooth and seamless transition to this new system.

Unfortunately so much of our air system relies on outdated technologies – some have even said that the technology in the blackberrys that we all use is more up to date than the technology that we use in our airplanes.

It is estimated that over the next 15 years, the number of US flights could triple – from 50,000 to 150,000 flights every 24 hours. And to handle this load we need to deploy satellite and GPS technology and fully implement the NextGen proposals.

But as we all know, to make this transition as seamless and efficient as possible, we will need to provide diligent oversight and be sure that the FAA meets established program deadlines – and that is what today's committee hearing is all about.

NextGen will allow us to move to a far more advanced – and safe -- method of guiding planes to their point of destination. It will increase system capacity, reduce travel times, cut fuel use and decrease noise pollution.

If we do not fully fund and expedite the implementation of NextGen, the American people will be subject to needless and unacceptable travel delays, and our economy will lose millions -- if not billions -- of dollars in lost economic productivity for our nation.

We need to make the necessary investments now to ensure that American air travel remains the envy of the world.

Statement of Rep. Harry Mitchell
House Transportation and Infrastructure Committee
Subcommittee on Aviation
7/29/09

--Thank you Mr. Chairman.

--By upgrading our nation's aviation system from radar to satellite-based, NextGen holds great promise.

--In particular, NextGen area navigation and required navigation performance can significantly improve both economic and environmental efficiency.

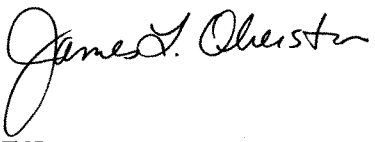
--It has been reported that, using these new procedures with 34 planes, Qantas Airline in Australia was able to save a total of 4200 minutes of flying, 65,000 gallons of fuel, and 621 metric tons of carbon dioxide emissions over the course of a year.

--In the United States, United Parcel Service has reported savings of between 37 to 69 gallons of fuel per arrival, using modified procedures.

--These procedures are certainly worth of our attention, and I am glad we are examining them today.

--I look forward to hearing from our witnesses.

--At this time I yield back.



OPENING STATEMENT OF
THE HONORABLE JAMES L. OBERSTAR
SUBCOMMITTEE ON AVIATION
HEARING ON
NEXTGEN: AREA NAVIGATION (RNAV) AND REQUIRED NAVIGATION PERFORMANCE (RNP)
JULY 29, 2009

I want to thank Chairman Costello for calling today's hearing on "NextGen: Area Navigation (RNAV) and Required Navigation Performance (RNP)." The deployment of RNAV and RNP procedures are a key near- to mid-term NextGen initiative. RNAV and RNP procedures are featured in the Federal Aviation Administration's (FAA) NextGen Implementation Plan, and they are expected to be a major part of the RTCA NextGen Mid-Term Implementation Task Force's final report that is due next month.

These procedures, which utilize aircraft avionics to enable aircraft to fly precise, fuel efficient and environmentally friendly routes into and out of airports, hold enormous potential. According to the Government Accountability Office (GAO) during a 12-month period, more than 8,000 RNP approaches at Brisbane, Australia, saved 34 Qantas 737-800 aircraft a total of 4,200 minutes of flying, 65,000 gallons of fuel, and 621 metric tons of carbon dioxide emissions. Since 2005, Alaska Airlines, an early RNP pioneer, has documented 5,300 flights that avoided diversions using RNP procedures. In 2008, avoiding these diversions saved the airline $8 million. I look forward to hearing from Alaska Airline's on their experience.

Because RNAV and RNP hold such potential, they are in high-demand by airlines. The FAA is under pressure to produce more and better quality procedures, and even expand the use of these procedures to seamlessly connect city pairs. There are, however, some implementation challenges that the FAA faces. For example, airlines want more direct routes into airports that will save more fuel, instead of overlays of existing ground-based navigational aids. However, more direct routes could trigger extensive environmental review. In addition, integrating new routes into congested airspace can present significant technical challenges such as complex design requirements that involve computer modeling, human factors studies, and actual flight and simulator trials. MITRE, the FAA's Federally Funded Research and Development Center, is testifying today, and I look forward to hearing more about these technical challenges.

Like other aspects of NextGen, RNAV and RNP will require considerable investment by the industry in both equipping aircraft, and in some instances, training pilots to fly these procedures. For example, Southwest Airlines has committed to invest $175 million to equip its aircraft and train its pilots to fly RNP procedures into the airports it serves. Southwest hired a private company to design "special" customized procedures and has started work at Houston and Dallas. Earlier this year, FAA officials expressed concern to this Subcommittee about the proprietary nature of

Southwest's procedures. I look forward to hearing our witnesses from the FAA, the Department of Transportation Inspector General's (DOT IG) Office and Southwest expand on this issue, and discuss the implications of other airlines following Southwest's approach.

More recently, Southwest has expressed its own concerns over the cost and length of the environmental review process needed to deploy more direct routes, and has indicated that it simply cannot achieve its needed return on investment unless it can obtain more direct routes than those already in use by the FAA. I would like to hear from the FAA and our other witnesses regarding the environmental review process surrounding the deployment of these procedures.

A final issue that concerns me is that, in 2007, the FAA entered into agreements with two non-governmental third-parties (Naverus and Jeppesen) to design and implement FAA "public" RNP procedures. It is unclear to me what role the FAA originally intended for these companies, or how they fit into FAA's NextGen plans. We have a witness here from Jeppesen that will talk about the role the company envisions for itself, and what services it thinks it can provide to the FAA. In addition, the president of the union representing technicians and specialists

who certify and maintain FAA equipment and procedures, the Professional Aviation Safety Specialists, has repeatedly expressed doubts about the FAA's ability to adequately regulate, supervise or review the work of third-party RNP design initiatives. H.R. 915, the "FAA Reauthorization Act of 2009", requires the DOT IG to assess the FAA's reliance on third-parties for development of new procedures and determine the FAA's ability to provide oversight. I would like to hear from the DOT IG's office what it has found so far.

Thank you again, Mr. Chairman, for holding this hearing. I look forward to hearing from our witnesses.

STATEMENT OF

REP. THOMAS E. PETRI, Ranking Member

SUBCOMMITTEE ON AVIATION

HEARING ON

NextGen: Area Navigation (RNAV) and Required Navigation Performance (RNP)

July 29, 2009, 10:00 am, 2167 RHOB

I thank the chairman for calling this important hearing on the development of NextGen air traffic control procedures.

The task of transitioning to the NextGen air traffic control system is a vast undertaking that will take years to accomplish.

Nobody expects the FAA to simply flip a switch to start delivery of NextGen benefits. However, both the agency and the industry have pointed to a number of programs with the potential for delivering NextGen benefits in the relative near-term.

"Area Navigation" and "Required Navigational Performance" air traffic control procedures, commonly known as RNAV/RNP [*pronounced "R-nav/RNP"*], may provide an early opportunity for expedited NextGen benefits.

These procedures, which are currently utilized at some locations in the National Airspace System (NAS), hold a lot of promise for reducing fuel burn and emissions by allowing for more direct and efficient routes in and out of airports. With widespread use, the procedures also hold promise for increasing capacity at airports as well as increasing air traffic controller productivity.

However, according to industry experts, sizable investments, as high as $410,000 per aircraft, would have to be made to retrofit airline fleets. In addition to equipage costs, airlines will also incur the costs for the training and certification of pilots to fly the more precise procedures.

Finally, the FAA would need to train air traffic controllers on how to manage the new traffic patterns that would result from the use of more efficient RNP routes into airports.

A major challenge FAA must address is how to best develop these procedures so that airlines and the FAA can enjoy the benefits needed to justify the cost of equipage and training.

For instance, if the FAA simply writes the new procedures over the old flight paths, called overlays, then airlines will not be flying significantly more efficient routes. In such cases, efficiency gains and fuel burn savings would not be enough to justify equipage and training costs.

On the other hand, if the FAA only approves procedures drawn for the most direct routes, it may limit system capacity as air traffic controllers seek to manage more complicated traffic at airports. I am interested in hearing about the FAA's plan to balance these considerations and deliver the best efficiencies new technologies and procedures can offer.

With regard to the integration of RNAV/RNP capabilities, the FAA's "best-equipped, best-served" policy was highlighted at the subcommittee's last NextGen hearing. That policy entailed the promise of more efficient air traffic control routing for the best-equipped aircraft in order to incentivize improved equipage.

I am eager to hear how that policy will be implemented, especially in cases where some aircraft are equipped and others are not.

We must also consider the challenges posed by environmental review requirements under the National Environmental Protection Act (NEPA). It is my understanding that for most new high efficiency RNP routes, the environmental review period may take as long as eight years and cost as much as $5 million. I am interested in hearing how environmental reviews may impact the "near-term" benefits of RNP procedures.

Finally, there has been much debate over the last two years about the FAA's ability to keep pace with the demand for RNAV/RNP procedures. I look forward to hearing the panel's views on the use of third-parties to develop flight procedures, subject to FAA certification, in order to accelerate the use of RNAV/RNP routes. It is my understanding that Administrator Babbitt is supportive of such an approach, and I am interested in hearing the FAA's plan for utilizing industry's expertise.

With that, I thank the witnesses for appearing today and look forward to hearing their testimony.

Alaska Airlines

Testimony of Captain Gary Beck
Vice President, Flight Operations
Alaska Airlines

Before the
Subcommittee on Aviation
Committee on Transportation and
Infrastructure
United States House of Representatives

NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)

July 29, 2009

Chairman Costello, Ranking Member Petri, and Members of the Subcommittee: My name is Gary Beck. I am the Vice President of Flight Operations for Alaska Airlines. I came to Alaska Airlines from Delta Airlines, where I served as senior vice president of flight operations, captain and chief pilot. I am pleased to testify today on behalf of the Air Transport Association and offer Alaska Airlines' unique experience with and perspective on Required Navigation Performance (RNP) technology. My testimony today will focus on three key points:

I. RNP is proven technology.

Alaska Airlines has a relatively long history with RNP technology, having pioneered its use during the mid-1990s to improve the safety and reliability of our flights operating in and out of Juneau, Alaska, an airport known for its bad weather and challenging, mountainous terrain. The first RNP-guided flight path was used by Alaska Airlines to land in Juneau, Alaska, in 1996. As many of you know, RNP enables aircraft to fly more direct routes with pinpoint accuracy and reduces diversions due to weather by using onboard navigation technology and the Global Positioning System satellite network. It improves safety and reliability in all weather conditions and reduces reliance on ground-based navigation aids. You could say that the rough terrain and equally rough weather in the state of Alaska gave the company the business case to invest early in innovative technology that could help us more reliably and safely serve communities throughout the state. In so doing, our corporate leaders then took a risk in being the first major U.S. air carrier to invest in RNP, an unproven technology at that time. We believe that risk was one worth taking: Today we are the only major domestic air carrier with a completely RNP-equipped fleet and fully trained crews. In addition to RNP, our all-Boeing 737 fleet is also 100 percent equipped with other modern safety technology, including the Heads-up Guidance System, which allows take-offs and landings at the lowest minimum weather conditions certified by the FAA, as well as the Runway Awareness and Advisory System (RAAS) – a key tool in alleviating runway incursions. Alaska is the first U.S. passenger carrier to install RAAS on all of its aircraft.

Since that first RNP flight into Juneau in the mid-1990s, Alaska Airlines has launched RNP procedures, in partnership and with the approval of the FAA, in Palm Springs, San Francisco, Portland, Oregon, and cities throughout the state of Alaska. Alaska Airlines was also the first carrier to use RNP precision technology to land aircraft at Reagan

National Airport right here in Washington, D.C., having worked with FAA after 9/11 on the development of the Reagan procedures. Recognizing the safety and environmental advantages of RNP approaches and landings, the FAA worked diligently to make the RNP procedures publicly available to all airlines that operate at Reagan National. In total, Alaska Airlines currently has RNP approaches available to us at 23 airports throughout our system, nine of which we developed, with the coordination and approval of the FAA. In another "first" on the RNP front, last December, the FAA approved Alaska Airlines to become the first U.S. commercial air carrier to conduct its own RNP flight validation, laying the groundwork for faster procedure approvals.

II. RNP saves time, fuel and emissions.

The numbers speak for themselves. For example, in 2008, Alaska Airlines used RNP procedures 12,308 times; 1,774 of those were "saves." A "save" is defined as an operation that would not have been completed if RNP were not available; in other words, the flight would either have been canceled or diverted. In so doing, we saved 1.5 million gallons of fuel, which equates to a savings of approximately 17,000 metric tons of Co2 emissions. In addition, we realized a savings of $17 million in operating costs.

III. RNP is a key tool in the "NextGen" modernization effort.

The original purpose of RNP was to provide guidance to runways with Navaids and to reduce minimums. However, RNP is now taking a new path. As part of the NextGen effort, the same technology can and should also be used to enhance capacity and create more efficient approach and departure paths. In order for the operational and environmental benefits of these more efficient paths to be realized, the FAA must implement new standards and procedures that enable the technology to be fully utilized. For example, the FAA must develop new, reduced separation standards that take advantage of RNP's technological capabilities.

At Sea-Tac airport, in Seattle, Alaska Airlines is leading an effort, in partnership with the FAA, the Boeing Company, the Port of Seattle and Southwest Airlines, to use RNP in just this way – to create more efficient approach paths that will reduce flight path length and, in turn, reduce time in the air, fuel consumption, emissions and noise. This Sea-Tac project is leading edge on the RNP front, in that it involves the use of RNP in complex airspace, requiring air traffic to be sequenced and spaced at altitude, as

opposed to in the terminal airspace. We are currently working closely with the FAA to address all the challenges that come with implementing this sort of cutting-edge use of RNP. This project directly furthers the FAA's NextGen mission: The lessons learned from and benefits of the Sea-Tac project can be replicated at major airports across the country. The benefits are impressive: Carriers equipped to fly these procedures at Sea-Tac will save more than 2 million gallons of fuel per year, which equates to an annual savings of 22,400 metric tons of Co2 emissions. The airline industry and the FAA should be leveraging the use of existing technology as much as possible to create airspace efficiencies and reduce aviation's impact on the environment. That really is the mission of "NextGen." And RNP is a key tool in the execution of that mission. Alaska Airlines is proud to continue our history of technological innovation in our use of RNP at Sea-Tac. We look forward to replicating the benefits of this project for all equipped users at airports across the country.

That concludes my oral testimony. I am pleased to answer any questions from the Committee.

U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

July 31, 2009

Captain Gary Beck
Vice President, Flight Operations
Alaska Airlines
1201 Pennsylvania Avenue, NW
Suite 500
Washington, D.C. 20001

Dear Captain Beck:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
CAPTAIN GARY BECK
VICE PRESIDENT, FLIGHT OPERATIONS
ALASKA AIRLINES

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

Alaska Airlines

August 13, 2009

The Honorable Jerry F. Costello
Chairman
Aviation Subcommittee on Transportation and Infrastructure
2251 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman Costello:

Thank you for holding the Subcommittee on Aviation hearing: NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP).

Attached, for the record, are my answers to the questions submitted by Rep. Michael E. McMahon.

Again, thank you for your leadership on the important issue of modernization of our national air traffic control system.

Sincerely,

Captain Gary Beck
Vice President
Flight Operations

BOX 68900 SEATTLE, WA 98168-0900/206-433-3200

July 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
'NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
CAPTAIN GARY BECK
VICE PRESIDENT, FLIGHT OPERATIONS
ALASKA AIRLINES

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

   Response:

   Expediting NextGen into NowGen is certainly doable. Congress can expedite the implementation of NextGen by providing a significant up-front investment that will yield benefits over the next five years rather than the current FAA timeline of 2025. The FAA must invest in both air and ground infrastructure and demonstrate the benefits of early equipage to the aviation user community. This expedited approach not only will create jobs, but also will offer significant environmental, safety and operational benefits. Ultimately, our airline customers will reap the benefit of fewer delays and cancellations and will experience a more efficient airline operation. Additionally, the FAA must develop new, reduced separation standards that take advantage of RNP's technological capabilities.

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

   Response:

   No, from my viewpoint, we are not adequately funding all aspects of NextGen. For example, the current FAA budget does not sufficiently support the acceleration of systemwide deployment of RNP procedures with measurable operational and environmental benefits. In order to more quickly produce procedures with such measurable benefits, the FAA needs greater resources devoted to conducting the necessary safety and environmental evaluations.

PROFESSIONAL AVIATION SAFETY SPECIALISTS

1150 17th Street, NW, Suite 702, Washington, D.C. 20036
Telephone: (202) 293-7277 Fax: (202) 293-7727

Founded 1977

STATEMENT OF TOM BRANTLEY
PRESIDENT
PROFESSIONAL AVIATION SAFETY SPECIALISTS, AFL-CIO

BEFORE THE HOUSE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE – SUBCOMMITTEE ON AVIATION

ON
NEXTGEN: AREA NAVIGATION (RNAV)/
REQUIRED NAVIGATION PERFORMANCE (RNP)

JULY 29, 2009

Chairman Costello, Congressman Petri and members of the subcommittee, thank you for inviting PASS to testify today on the Next Generation Air Transportation System (NextGen): Area Navigation (RNAV)/Required Navigation Performance (RNP). The Professional Aviation Safety Specialists, AFL-CIO (PASS) represents approximately 11,000 FAA and Department of Defense employees in seven separate bargaining units throughout the United States and in several foreign countries. PASS members include Technical Operations employees (systems specialists, electronics technicians and computer specialists) who install, maintain, repair and certify the radar, navigation, communication and environmental systems making up the air traffic control system; Flight Standards and manufacturing aviation safety inspectors responsible for inspecting and certifying every aspect of the commercial and general aviation industries; flight inspection pilots, mission specialists and flight procedures development specialists in Aviation System Standards (AVN); examiners in the FAA's Civil Aviation Registry; and support staff.

The FAA is employing new Performance-Based Navigation (PBN) routes and procedures in its effort to modernize the aviation system. The two primary elements of the PBN structure are Area Navigation (RNAV) and Required Navigation Performance (RNP). RNAV allows aircraft to fly on a flight path within the coverage of ground- or space-based navigation aids, within the limits of the capability of the self-contained systems, or within a combination of both capabilities. RNP is the same as RNAV but also includes an onboard performance monitoring and alerting capability. Both PBN components are critical to the design and installment of flight paths, and the FAA states that "several NextGen solutions are dependent on RNAV and RNP implementation as enabling technology in the NAS [National Airspace System]."[1]

It is generally accepted among government and industry that the use of RNAV/RNP routes and procedures has great potential to enhance system capacity and productivity as well as reduce environmental impacts and fuel costs. PASS agrees that these benefits should be fully and safely pursued to help our nation's aviation industry remain viable into the future. However, the promise of anticipated benefits without clear guidance and leadership from the FAA has led to conflicting ideas among industry, FAA and even congressional proponents as to how these benefits can be realized.

PASS thanks the subcommittee for holding this hearing to consider all points of view so that the integrity and safety of the NAS is not compromised.

Strategy Needed for NextGen Success

An agenda supported by many in the aviation industry and advanced by some members of Congress promotes setting quotas for the production of new RNP procedures without regard for the feasibility of such an approach. While the number most advanced by proponents of this approach is 200 RNP procedures annually, PASS believes that any quota at this time is unrealistic, very likely unachievable, and would not be based on the potential safety, capacity and operational benefits to the overall NAS.

[1] Federal Aviation Administration, "Fact Sheet: NextGen Goal: Performance-Based Navigation RNAV and RNP Evolution Through 2025,"April 24, 2009.

The time required for the development of any procedure depends on many factors, including the complexity of the airspace, interactions with other procedures, the need for environmental assessments or obstruction evaluations, and the amount of coordination required between aviation customers, other major stakeholders such as the airport authority and appropriate offices within the FAA. Therefore, the push for large quantities of procedures to be developed will not necessarily result in the procedures being implemented into the system due to all the other factors that must be considered.

Development of new procedures can take two paths: (1) public-use procedures meant for the use of all qualified users within the aviation community and (2) special-use procedures meant for the benefit of the user developing them. Development of public-use procedures has historically been the responsibility of the FAA, and PASS believes it should remain so. It is in the development of special-use procedures where the use of third-parties has historically taken place, although the demand has never been as high as it is today. Carriers have begun to drastically increase the development of special-use procedures for their individual benefit, which aligns with the "best-equipped, best-served" policy offered by the FAA in its 2009 NextGen Implementation Plan. Under the policy, early adopters of avionics equipage that the FAA is targeting for midterm NextGen operations will receive "priority in the NAS."[2] However, missing from this scenario is a clear understanding of what "best-equipped, best-served" actually means. The FAA did not define the meaning of the policy or what it would take to implement it. Instead, the agency asked the RTCA NextGen Implementation Task Force to help define the specific details, including how to implement the policy in a manner that maintains safety while also meeting the needs of the aviation community. The task force's report is due next month, but some of the confusion that exists today is undoubtedly related to assumptions about what the policy will ultimately mean.

A premise that has always been followed by the FAA in approving special-use procedures is that they may not unduly conflict with the public use of airspace.[3] This can be in direct conflict with the "best-equipped, best-served" policy that the agency is advocating. Areas in which industry may realize the greatest benefit are also some of the busiest airports in the country. That means that a special-use procedure developed for the benefit of a single user must be integrated into the overall management of the airspace, which may not always satisfy the "best-equipped, best-served" philosophy. If one carrier has an approved special-use procedure, does it now have priority over all other airspace users, regardless of how many other users there are? In other words, if a special-use procedure interacts with or overlaps a public-use procedure, does the lone special-use carrier take priority over all other users of the airspace? Congested airspace, as found in nearly all areas where new procedures will be targeted, involves complex design requirements with strict criteria, including computer modeling, human factors studies, and actual flight and simulator trials. Quite simply, the development of new procedures aimed at meeting an arbitrary target does not take into account the need to coordinate new procedures with corresponding airspace redesign efforts so that potential conflicts are not created that can ultimately slow the realization of benefits to the aviation community.

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[2] Federal Aviation Administration, *FAA's NextGen Implementation Plan 2009* (Washington, D.C.: revised February 10, 2009), p. 13.

[3] FAA Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS), paragraph 120b.

The FAA has said that it believes it needs to take a strategic approach to RNP procedures development and any corresponding airspace redesign work that is required to deploy those procedures. PASS agrees with this approach to developing new RNP procedures and stands ready to work with the FAA and other stakeholders to accomplish the transition to the new capabilities.

Procedures Development and Oversight

Flight procedures and flight inspection employees in AVN are charged with developing, evaluating, certifying by flight inspection and maintaining the more than 18,000 instrument flight landing and takeoff procedures for every major and municipal instrument-capable airport across the country. PBN procedures make up 43 percent of this total.[4] AVN flight procedures and flight inspection employees have met or exceeded every legacy and new technology PBN goal set forth by the FAA. The expansion of flight procedures capacity that has evolved because of the deployment of new instrument landing systems and other airport improvements at major and municipal airports across the country is evidence of the expertise of the AVN workforce. This growth has not only benefited commercial aviation but it has also allowed general aviation and business aviation carriers to use ground- and satellite-based navigation capabilities. The development, implementation, flight inspection and maintenance of flight procedures supporting this growth requires the proper interpretation of a complex series of computations, measurements and modeling standards, strict compliance with diverse criteria, extensive coordination with multiple stakeholders, and the frequent adaptation of procedures in an ever-changing aviation environment.

The complexity and diversity of work required to oversee the development of flight procedures is unfamiliar to most people outside of those who actually perform the work. The work involves developing an integrated infrastructure, not individual standalone procedures. Before the procedures development process even begins, aeronautical, airport and obstacle issues must be resolved; controlled airspace and air traffic flow must be taken into consideration, as well as aircraft equipage, airport infrastructure and environmental issues; military coordination and airspace rulemaking processes are initiated, where appropriate; agreements with local airport authorities are established; and coordination with the air traffic controllers' union and training requirements are assured. It is *after* a proposed procedure has been determined to be feasible that the development process can begin. During the development process of a specific procedure, changes in other procedures are often identified and further coordination needs to be initiated to ensure that all procedures are updated. The amount of coordination that occurs within the FAA to ensure that all of these things happen at the correct time and in the appropriate order is remarkable.

The quality assurance process, including the flight checking and integration of procedures into the NAS, is the backbone of assuring the safety, integrity and certification of all instrument flight procedures, whether to support legacy or performance-based RNAV and RNP requirements. The FAA flight procedures and flight inspection program is the only program in the nation that includes everything from the development to the airborne certification of navigation systems and

[4] FAA Instrument Flight Procedures (IFP) inventory for publication July 2, 2009. Available at: http://avn.faa.gov/index.asp?xml=nfpo/inventory-summary.

flight procedures and their subsequent integration into the NAS. PASS is very concerned that the FAA will allow the introduction of mass quantities of third-party developed and self-certified flight procedures into the NAS without the protections in place that are established under Federal Aviation Regulation (FAR) Part 97, FAA orders and other directives, all of which establish the FAA's responsibility to guarantee the safety of flights within the U.S. airspace. If allowed to proceed unchecked, as many have advocated, the privatization of flight procedures development and oversight will virtually erase the present standard of integrity of the instrument flight procedures infrastructure in our current and future NAS.

Both flight validation and flight inspection are the responsibility of the FAA. Flight validation is an assessment of the flyability of a procedure or, in laymen's terms, a determination whether a procedure can be safely flown. Flight inspection certifies that appropriate navigational aids, such as the Distance Measuring Equipment (DME) facilities that are critical to many performance-based RNAV procedures, adequately support each procedure. It also certifies that procedure-controlling obstacles are verified, that adequate obstacle and terrain clearance are provided, navigation data is correct, all required infrastructure are in place and operative, and that other operational concerns such as human factors have been effectively considered in the development process. This must all be performed whether a procedure will be flown by experienced or less-experienced pilots in a multi-engine air transport or single-engine Cessna. Flight inspection is carried out as part of the program regulated by the U.S. Standards Flight Inspection Manual and is performed by qualified, certificated flight inspectors using uniquely equipped Automatic Flight Inspection Systems (AFIS) aircraft that gather data to certify procedures for use by any aircraft capable of using that procedure.

Current administration regulations and directives provide for third-party development of special-use operational and approach procedures; as explained above, special-use procedures are not fully integrated into the NAS. However, over the last few years, the FAA has been pressured to contract out the development of public-use procedures. AVN employees represented by PASS have expressed concern with the FAA's ability to fully and safely integrate third-party developed procedures into the system since a single procedure cannot just be added into the system without considering the affect such an addition will have on the NAS as a whole. PASS believes this safety-critical work to be inherently governmental and should not be outsourced to private vendors.

Furthermore, PASS has identified issues with outside vendors developing procedures. PASS has learned of a situation in which a vendor was contracted to perform RNP work for a major airline but procedures for at least two airports (Raleigh-Durham International Airport, N.C., and Boise Air Terminal/Gowen Field, Idaho) had to be redone by AVN employees. The work originated with the vendor but has since been moved back to the FAA with the vendor now serving as a sort of consultant. While private companies make claims to be able to produce procedures "faster" and "cheaper," if the procedures are not correct or properly coordinated, the purported benefits of outsourcing the work are nonexistent.

The FAA recently stated that it has the production capacity to meet existing implementation demand by reallocating resources to meet production goals. The agency emphasized that if its ongoing focus is on development and implementation of the appropriate procedures at that time,

rather than arbitrary quotas that are not directly related to user and operational benefit, it can accomplish the necessary development without large-scale privatization of the function. PASS concurs with the FAA's assessment of the situation and believes that there should be no efforts to expand the contracting out of this work. With airspace infrastructure around our nation's airports becoming increasingly crowded and complex, delegating out the work performed by professional FAA flight inspection and flight procedures employees puts at risk the basis of this country's aviation system.

Conclusion

The AVN workforce is critical to the safe development and implementation of RNAV and RNP procedures. FAA flight procedures development specialists and flight inspectors receive intensive training before being deemed qualified and certified with the responsibility and authority to develop and integrate flight procedures into the NAS and to certify the flight inspection of NAS equipment and instrument flight procedures.

PASS appreciates the efforts of this committee to include language in its version of the FAA reauthorization legislation requiring the Department of Transportation Inspector General (IG) to review third-party approach procedures development. Examining the effectiveness of the oversight activities conducted by the FAA over any third party charged with the development of flight procedures will no doubt assist both FAA and Congress in determining areas in need of strengthening in order to protect work performed on the NAS. PASS is especially encouraged by the language calling on the IG to assess whether the administration has sufficient existing personnel to guarantee the safe development of flight procedures.

PASS agrees that the FAA must take a strategic approach to RNAV and RNP procedures development. To accomplish this successfully, PASS believes the FAA must include all stakeholders, including representatives of affected agency employees, in developing a plan that identifies what changes must be made to realize the benefits of NextGen operations. This plan should incorporate all aspects of the significant changes that will be required to achieve the efficiency and capacity gains that NextGen capabilities will allow. Among these are changes to performance-based RNAV and RNP operations and the procedures associated with those changes, as well as the integration of current and future airspace redesign efforts into the plan. The plan should also contain the actions required for implementation, including timelines and specific milestones. Finally, the plan should prioritize the development and implementation of new flight procedures based on their potential safety, capacity and operational benefits to the overall NAS and not arbitrary quotas.

Without a doubt, there are benefits in terms of safety and operation that can be achieved through the safe expansion of PBN procedures. PASS stands ready to work with the FAA and other stakeholders to accomplish the transition to the new capabilities. The highly skilled and professional AVN employees are fully capable of meeting the performance-based RNAV and RNP needs of NextGen. PASS believes that keeping this inherently governmental where it belongs—being performed by the FAA's flight procedures and flight inspection program—is not only the fastest and most cost efficient way to proceed but the only manner that will protect the safety of the aviation system.

U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

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July 31, 2009

Mr. Tom Brantley
President
Professional Aviation Safety Specialists, AFL-CIO
1150 17th Street, Suite 702
Washington, D.C. 20036

Dear Mr. Brantley:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
MR. TOM BRANTLEY
PRESIDENT
PROFESSIONAL AVIATION SAFETY SPECIALISTS, AFL-CIO

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

July 29, 2009 – Subcommittee on Aviation – Hearing on NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)

Questions For The Record

To: Mr. Tom Brantley, President

Professional Aviation Safety Specialists, AFL-CIO

1. I commend all the important planning for NextGen - but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

As you know, much of the benefit to be derived from NextGen requires the use of new Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures. PASS believes that the biggest challenges will not be related to the FAA's inability to develop new procedures. On the contrary, the agency has exceeded its annual goals for procedure development every single year of the NextGen program. The real concern that we believe should be closely watched is the FAA's ability to manage the overall transition from today's ground-based procedures to tomorrow's satellite-based procedures.

As stated in PASS's testimony, we cannot forget that the changes that are coming include people–not just technology and procedures. Obstruction and environmental issues must be resolved; controlled airspace and air traffic flow must be taken into consideration; airspace rulemaking processes must be initiated; and coordination with air traffic is needed to ensure that the new procedure can be safely integrated into the management of the airspace, including integration with airspace redesign efforts that are already underway.

There will only be one opportunity to make the transition to the new capabilities without compromising the safety or integrity of our National Airspace System (NAS). PASS believes that the FAA must develop a comprehensive plan that takes into account the incredible complexity involved in transitioning to NextGen capabilities. There will be no benefit in developing 500 new procedures next year if the agency is only able to implement 30. In fact, a push by the FAA to greatly expand procedure development will be seen by the aviation industry as a signal to accelerate the acquisition of new technologies in order to use the new procedures. If airlines spend millions of dollars on new technology that they won't be able to fully or efficiently use for an extended period of time, it will add to the financial problems the industry already faces.

So far, the FAA has published high-level descriptions of the its NextGen implementation philosophies, but not a clearly defined plan that specifically explains how quickly the agency can implement new procedures, what the agency's priorities are with regard to the locations and types of new procedures, and a timeline for proposed implementation. PASS feels that the FAA must provide such a plan in order for the industry to understand

its responsibilities for technology acquisition and its expected benefits to be realized as a result.

The Senate included language in its FAA reauthorization bill (Sec. 314) to require the FAA to develop a very detailed plan for implementing NextGen. The FAA would be required to consult with representatives of employee groups, airport operators, air carriers and aircraft manufacturers, and include the required RNP/RNAV operations, including the procedures to be developed, certified, and published and the air traffic control operational changes needed to implement the procedures. It would also contain a plan for implementing those procedures with a clearly defined budget and schedule; detailed project organization and leadership requirements; specific implementation and transition steps; and baseline and performance metrics for measuring the administration's progress in implementing the plan.

Assuming Senate passage of an FAA reauthorization bill this year, PASS recommends that the House consider adopting the provision contained in Section 314 of the Senate bill when the House and Senate meet in conference on the FAA reauthorization bill.

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

PASS believes that a comprehensive answer to your question requires the FAA to produce a detailed plan for NextGen development and implementation, as described in the previous answer. It would be very difficult to make informed suggestions to Congress on NextGen funding without the information necessary to develop those suggestions with confidence.

Before the Committee on Transportation and Infrastructure
Subcommittee on Aviation
United States House of Representatives

For Release on Delivery
Expected at
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July 29, 2009
CC-2009-086

Challenges in Implementing Performance-Based Navigation in the U.S. Air Transportation System

Statement of
Ann Calvaresi-Barr
Principal Assistant Inspector General
for Auditing and Evaluation
U.S. Department of Transportation

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to testify today on the Federal Aviation Administration's (FAA) efforts to modernize airspace through Area Navigation (RNAV) and Required Navigation Performance (RNP). These initiatives are cornerstones of the Next Generation Air Transportation System (NextGen), which will move today's ground-based air traffic control system to a more efficient one that relies on satellite navigation and on-board aircraft avionics. The potential benefits of RNAV and RNP are significant and include shorter, more direct flight paths; improved airport arrival rates; enhanced controller productivity; fuel savings; and reduced aircraft noise.

FAA and industry plan to invest billions of dollars over the next decade to bring about NextGen initiatives. To better ensure taxpayer dollars and private sector investments are used efficiently, FAA will need to carefully coordinate these efforts with industry stakeholders and within its own lines of business.

RNAV and RNP are key to NextGen's success, but fundamental issues need to be addressed. While RNAV and RNP have considerable industry support, some stakeholders are dissatisfied with the Agency's overall method for implementing these initiatives. Of particular concern is FAA's practice of laying most "new" routes over existing routes and the fact that air carriers are not using them. Stakeholders and FAA also disagree on the potential role, responsibilities, and oversight of non-Government third parties in speeding the adoption of RNP. Regardless of who develops the new procedures, FAA must provide one level of safety oversight.

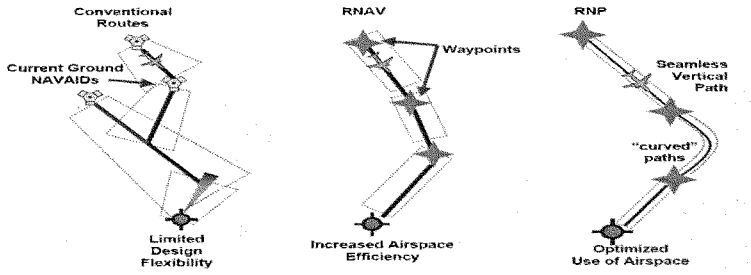
Today, I will cover two areas: (1) barriers and challenges affecting the successful implementation of RNAV and RNP and (2) the role and oversight challenges associated with use of third parties in developing new procedures. I will conclude with actions needed to ensure the safe and effective implementation of RNAV and RNP.

OVERVIEW AND BACKGROUND ON RNAV AND RNP

An important part of NextGen is the establishment of new routes and procedures that rely on satellite-based navigation. FAA first implemented RNAV in 2001 and RNP in 2005 as a way to increase national airspace capacity and efficiency. Since 2001, FAA has published 270 RNAV approach and departure procedures, 159 RNAV routes, and 148 RNP approach procedures.[1] FAA's goals are to annually publish 50 RNAV approach and departure procedures, 12 RNAV routes, and 50 RNP approach procedures through 2013.

There are important differences between conventional route procedures and RNAV/RNP. Traditionally, aircraft have flown conventional routes adhering to the ground-based navigational infrastructure, which requires aircraft to fly in a zigzag pattern so that they can be tracked by air traffic control radar systems. RNAV and RNP increase airspace efficiency by providing more direct paths (see figure).

Figure. Conventional, RNAV, and RNP Navigational Methods



Source: FAA

For RNAV, aircraft use an on-board Global Positioning System (GPS) to fly any desired flight path without the limitations imposed by ground-based navigation systems. RNP is a form of RNAV that adds monitoring and alerting capabilities to the cockpit to guide aircraft more precisely to and from airports. Currently, RNP routes are only available to specially equipped aircraft and trained aircrews, and air carriers must meet certain qualifications to fly these RNP approaches.[2]

Alaska Airlines pioneered RNP in 1996 to address unique terrain and weather challenges it faced in Juneau, Alaska. RNP-equipped aircraft allowed pilots to safely navigate between mountains on either side of the Gastineau Channel even during

[1] While FAA has implemented RNP procedures for arrivals, it has not yet developed procedures for departures or routes that link city pairs.

[2] This is referred to as RNP Authorization Required, or "RNP AR."

times of low visibility—this reduced the number of canceled and diverted flights into Juneau during bad weather. Alaska Airlines has implemented about 20 special RNP procedures, with annual average savings of about $14 million. It was not until several years later that FAA implemented the first public RNP procedure.

RNP procedures can be developed as public or special procedures. Public procedures are available to all users that have properly equipped aircraft; special procedures are only available to a specific air carrier for whom the procedure was designed. While FAA allows special procedures, these have historically been implemented only on a limited basis for commercial airlines. Of the more than 500 RNAV and RNP routes and procedures, 148 are public RNP procedures and 30 are special RNP procedures. Table 1 provides details on the differences between public and special procedures.

Table 1. Public and Special RNP Procedures

Requirements	Public RNP Procedures	Special RNP Procedures
Who Can Use the Procedure?	Available to all users that have properly equipped aircraft	Only available for a specific air carrier for which the procedure was designed
Publication/Federal Aviation Regulation	Federal Register in accordance with 14 C.F.R. Part 97[/a]	Not Published/Non-Part 97
Number of Procedures	148 RNP AR	30 RNP AR
Who Develops and Implements?	*Currently:* FAA's Office of Aviation System Standards *Proposed*: Third parties	FAA's Office of Aviation System Standards and private industry procedure developers (airlines and third parties)
Who pays?	FAA	Airspace user and FAA[/b]

/a Standard Instrument Procedures, 14 C.F.R. § 97 (1963). This FAA regulation governs the development of standard instrument approach procedures to airports in the United States.

/b Airspace users usually pay for special procedures, but FAA may provide this service to industry in some cases.

Other countries such as Canada, Australia, China, and New Zealand have implemented RNP procedures in recent years. For example, 18 RNP departures and approach procedures deployed at the airport in Brisbane, Australia, have been flown more than 15,000 times and have provided measurable benefits, such as fuel savings and reduced flight time, to the airlines that flew them.

Significant numbers of U.S. commercial transport aircraft are already equipped for some level of performance-based navigation.[3] Almost all U.S. air carriers are equipped to perform RNAV at the Nation's top 35 airports; however, the percentage

[3] FAA defines performance-based navigation (PBN) as a framework for defining navigation requirements that can be applied to air traffic route, instrument procedure, or defined airspace. PBN comprises both RNAV and RNP and provides a basis for the design and implementation of flight paths that can enhance capacity.

of equipage for the more demanding RNP capability is much lower, and the number of aircraft and flight crews equipped and authorized to fly those procedures has lagged behind. For example, 10 major air carriers[4] have 97 percent of their aircraft equipped with RNAV capability, but only 47 percent are equipped with RNP capability, and just 23 percent are authorized to fly RNP procedures.

FAA and industry representatives believe RNP can provide several high-value operational improvements, particularly at or around congested airports. For example, RNP can improve capacity and arrival efficiency through the use of parallel approaches to closely spaced runways and approaches to converging runways. RNP can also de-conflict operations at adjacent airports (e.g., Chicago O'Hare and Chicago Midway) through curved, final approaches to runways. Moreover, aircraft currently use a staggered, "stair-step" pattern on approach for landing, but RNP can allow a more level approach while enabling aircraft to avoid obstacles, such as buildings, near the airport.

FAA FACES SIGNIFICANT CHALLENGES WITH RNAV/RNP IMPLEMENTATION

FAA has faced significant challenges implementing RNAV and RNP, and consequently, has not fully achieved the measurable benefits of these procedures. First, FAA's method for implementing new RNP procedures relies heavily on existing routes; as a result, air carriers are not using them. Second, continuing operational issues and concerns over workload and training for controllers and pilots have limited the use of RNAV procedures at some airports. Finally, FAA has not yet made adjustments to key programs such as airspace redesign efforts and modernization projects that will be needed to deliver the expected benefits of RNAV and RNP procedures.

Relying on Existing Routes Has Yielded Little Measurable Gain

While FAA has met or exceeded its annual RNP production goals, most of the RNP procedures it has rolled out have been overlays of existing routes because the Agency's goals primarily focus on the number of procedures produced. While overlaid routes can be deployed more quickly because they do not have to go through an extensive environmental review, they do not maximize the benefits that can be achieved through RNP procedures. As a result, industry is dissatisfied with the overall quality of RNP procedures, and they are not widely used.

Further, FAA has not established an effective process for analyzing and measuring the benefits of new procedures from a "before–and-after" perspective. FAA program

[4] Air Tran Airways, Alaska Airlines, American Airlines, Continental Airlines, Delta Air Lines, Jet Blue Airways, Northwest Airlines, Southwest Airlines, United Airlines, and US Airways.

officials also do not track data that would show how often airlines use RNP procedures or reasons why they are not being used. While FAA has implemented RNP at sites recommended by a joint FAA and industry group, the sites were based on prioritization work accomplished several years ago. FAA simply followed the list without performing updated analyses to ensure the procedures would be beneficial. For example, FAA designed and implemented a procedure in Palm Springs; yet, no air carrier has used the procedure since it was implemented because its design did not provide airlines with any measurable benefits, such as a shorter flight path or the ability to fly at lower altitudes.

One RNP procedure deployed at Reagan Washington National Airport has demonstrated some benefits. The procedure allows pilots to follow a more precise path—not available through conventional or RNAV procedures—along the Potomac River while avoiding restricted airspace and obstacles. While some air carriers are approved to use this procedure, only a few are actually using it because the procedure is designed specifically for a limited number of aircraft types.

FAA has also not updated its air traffic policies for controllers and pilots on how to use these procedures at airports with parallel runways. Due to current air traffic provisions,[5] controllers are not yet allowed to accept an RNP procedure into the National Airspace System (NAS) at some airports with parallel runways. For example, at the Atlanta Hartsfield International Airport, FAA implemented 10 RNP procedures in May 2007 hoping that updated air traffic policies would be in place. Absent updated policies, controllers have never cleared an aircraft for landing using an RNP procedure in Atlanta. FAA is still evaluating whether the policies can safely be updated through a project at George Bush Intercontinental Airport in Houston, but this is a lengthy process that has already taken more than 4 years. FAA expects to complete this evaluation by the end of calendar year 2009.

Even if FAA updates its policies and determines that RNP can be allowed at airports with parallel runways, airline representatives told us they would not use the RNP procedures at Atlanta because they are overlays of existing conventional procedures, thus providing little or no added benefits other than a backup in the event the ground-based navigation aid shuts down.

Operational Issues Limit the Use of RNAV/RNP Procedures

There have been significant benefits from RNAV procedures at certain airports such as Atlanta, Dallas Fort Worth, and Phoenix. For example, RNAV departure procedures implemented at Atlanta in 2006 have increased throughput and reduced delays with a measured capacity gain of 9 to 12 departures an hour. Fewer delays have resulted in cumulative fuel savings of about $105 million for the operators who

[5] FAA Order JO 7110.65, Air Traffic Control Handbook, paragraphs 5-9-6 and 5-9-7 prescribe aircraft separation standards required for parallel dependent and simultaneous independent operations.

flew these procedures through 2008. However, current controller and pilot training continues to limit the full use and effectiveness of these procedures. For example, at Dallas Fort Worth and Atlanta, there have been some recent operational problems related to pilots programming incorrect RNAV departure waypoints into the Flight Management System (FMS) and thus not flying the correct path.

To mitigate this problem, FAA has developed a process for pilots to read back the runway assignment and first waypoint before taking off. This process was implemented at Dallas Fort Worth on June 1, 2009, and will be implemented NAS-wide once a further safety study is completed. FAA estimates that it will be collecting data for another 30 to 60 days before deciding whether to change the process nationwide.

A longstanding operational concern is the potential impacts of "mixed equipage" where controllers will be expected to manage aircraft with different capabilities seeking to exploit different procedures. Mixed equipage presents a major challenge for the transition to NextGen. Experts believe that between 80 and 100 percent of aircraft at any given location will need to be equipped with new NextGen systems to realize benefits and limit the potential for introducing new hazards. Assessing and addressing the impacts of mixed equipage are also important for several efforts that rely on aircraft equipage, including RNAV/RNP, data link communications for controllers and pilots, and Automatic Dependent Surveillance-Broadcast (ADS-B).[6]

A prolonged mixed-equipage environment is not desirable and will likely increase—not decrease—controller workload. This is one reason why some believe incentives will be needed to spur airlines to purchase and install new avionics. In the interim, FAA needs to develop plans to mitigate differences with aircraft equipage. This includes developing effective training for controllers and pilots and adjusting existing air traffic control systems. FAA may also have to segregate specific airspace for properly equipped aircraft.

New Procedures, Airspace Redesign Efforts, and Modernization Projects Are Not Operationally Integrated

As we noted in March of this year, FAA will need to manage capacity-enhancing initiatives as portfolios to deliver benefits because new systems, new procedures, and airspace changes are interdependent.[7] To date, FAA has not developed a plan to effectively manage and budget for the elements necessary to deliver RNP benefits at already congested airports. This is particularly important as FAA shifts away from overlays of existing routes to more complex and demanding ones that can enhance the

[6] ADS-B is a surveillance system that uses information from satellite-based systems to identify and track aircraft positions.
[7] OIG Testimony Number CC-2009-044, "Federal Aviation Administration: Actions Needed To Achieve Mid-Term NextGen Goals," March 18, 2009. OIG reports and testimonies are available on our website: www.oig.dot.gov.

flow of air traffic. Greater reliance on RNAV/RNP will force FAA to reevaluate budgets and plans for several key efforts.

- Airspace Redesign: Airspace redesign projects are critical to realize the full benefits of runways and can enhance capacity even without new infrastructure. Currently, FAA is pursuing six airspace projects nationwide,[8] including a major but controversial effort to revamp airspace in the New York/ New Jersey/Philadelphia area. This project is undergoing litigation and has drawn public concerns about its environmental impact on the area. FAA plans to spend $11.2 million[9] in airspace redesign efforts in fiscal year 2009. A level of coordination between airspace redesign projects and RNAV/RNP procedures—that currently does not exist—will be essential as procedures move beyond overlays and local operations to networking routes between city pairs such as Chicago, Illinois, and Washington, D.C. Also, FAA will have to reassess its budget and plans for airspace redesign efforts to ensure adequate and stable funding.

- Air Traffic Control Modernization Projects: FAA will have to modify the automation systems, such as controller displays and related computer equipment, that controllers rely on to manage traffic in the vicinity of airports. According to FAA and others, a software enhancement that will allow controllers to merge and space aircraft is needed to obtain the benefits of new RNP procedures for enhancing airport capacity. This will also help controllers to safely manage traffic in a mixed-equipage environment. However, FAA has only begun planning and developing requirements for this capability; therefore, the cost and schedule parameters needed to adjust existing systems have not been baselined.

- Controller Training Programs: FAA lacks extensive and up-to-date training programs to help controllers understand and manage RNAV/RNP aircraft. This is particularly important given the large number of developmental controllers in the system. FAA's training on new procedures consists of briefings rather than formal courses on RNAV/RNP. As FAA moves toward implementing more advanced RNP routes, extensive training will be required for controllers to gain confidence in their ability to use RNAV/RNP. As one industry expert pointed out, simulators will be needed to support the training of the controller workforce. Without adequate controller training, RNAV/RNP cannot be successfully introduced.

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[8] These projects are (1) New York/New Jersey/Philadelphia Redesign (2) Chicago Airspace Project, (3) Houston Area Traffic System, (4) Western Corridor, (5) Oceanic, and (6) High Altitude Airspace Management.

[9] Of the $11.2 million funding, $8.2 million was received from the Agency's operations account and $3.0 million was received from its capital account.

FAA HAS NOT CLEARLY DEFINED THE ROLE OF THIRD PARTIES AND FACES CHALLENGES IN ENSURING EFFECTIVE SAFETY OVERSIGHT

The role of third parties in developing RNAV/RNP procedures is unclear, and industry representatives are skeptical of FAA's ability to deliver the more complex procedures in a timely manner. Any use of third parties will inevitably carry a new layer of safety concerns, and FAA has yet to establish a coordinated oversight framework to mitigate potential operational risks.

The Role of Third Parties is Unclear, and Stakeholders' Views of Benefits Differ

FAA entered into agreements in 2007 with two non-Governmental third parties to design, integrate, test, and validate public RNP procedures. According to FAA, the intent of the third-party initiative was to provide industry or the international community with FAA-qualified vendors who could develop procedures within and outside the United States where existing infrastructure was lacking or where the new procedures would not create complex integration and implementation issues.

Yet, FAA has never clearly communicated the potential third-party roles and responsibilities to airspace users. FAA does not plan to rely on third parties to help speed the adoption of RNP procedures for NextGen. FAA program officials told us that they do not need assistance from third parties in domestic airspace because the Agency has met or exceeded its goals for the number of procedures produced and has provided airlines with all the requested procedures. However, airlines disagree with this conclusion and continue to believe third parties could help speed up the adoption of quality RNP procedures.

In addition, the business case for third parties to develop public procedures for specific airlines does not appear to be workable. Third parties have not developed these in the past, and the extent to which air carriers will hire them to do so is still unknown. It will depend on whether air carriers believe it is cost beneficial to pay third parties to develop public RNP procedures. Industry representatives we interviewed questioned whether air carriers will be able to justify the cost for third parties to develop these types of procedures because they would benefit other carriers and can be obtained from FAA at no cost. In addition, representatives at one of the third-party vendors told us the agreement with FAA is not cost beneficial for them because it specifies that third parties will be responsible for maintaining the procedures, which increases their liabilities and risks.

The third-party process for developing special procedures is somewhat different. FAA has had a process in place for years in which third parties have developed special procedures as requested by specific operators. However, FAA approved these

only on a limited, case-by-case basis. RNAV/RNP program officials are now concerned that air carriers will increasingly request third parties to produce special procedures, which are tailored to the requesting airline's needs, rather than rely on public procedures produced by FAA. FAA states that an increasing number of special procedures will further complicate the workload of air traffic controllers and increase the complexity of the NAS.

As noted by industry, FAA can mitigate this problem by seeking ways to transition specials into public procedures that could be used by any airline that chooses to equip their aircraft and train flight crews. Recognizing that there may be a legitimate need for special procedures at some locations, FAA needs to ensure that its Flight Standards and Air Traffic offices coordinate at a national level to safely integrate any new special procedures into the NAS, especially if special procedures are more widely adopted going forward.

The role of third parties in moving forward with NextGen is a policy call for Congress. The nature and extent of this role hinges on the in-house skill mix and expertise of FAA and whether the Agency can deliver the more demanding procedures called for by industry. FAA could rely on third parties for specific projects based on a contractual relationship. As FAA points out, third parties could provide valuable expertise, capabilities, and resources that could complement FAA's efforts in the short and long term. However, third parties should not be relied on to conduct safety assessments of the procedures they develop.

FAA Has Not Established a Coordinated Oversight Framework for Third Parties

Absent clear roles and responsibilities, it is difficult at best for FAA to establish a plan to oversee third parties. To its credit, FAA has drafted guidance for industry on the authorization process used to design and develop RNP procedures and has begun developing an oversight plan. However, FAA will need to implement a formal oversight program to ensure that third parties properly follow FAA design criteria and procedures for key areas. These include flight validation, obstacle assessments, integration of the procedure into the NAS, and procedure maintenance. Without this foundation, the potential for operational problems and safety risks increases.

Past problems with implementation of new procedures show that safety issues can occur. We identified key areas in which FAA will need to establish strong oversight controls once it completes efforts to qualify these vendors. Based on an internal audit performed in 2007, FAA determined that the Agency had not performed required procedure maintenance reviews for 100 percent of the procedures sampled. These reviews are important because they check for routine maintenance of the procedures, including checking for new ground obstacles and other changes along flight paths.

Regardless of who develops the procedures, FAA must provide one level of safety oversight and address organizational barriers and fragmented efforts that exist between Agency lines of business. For example, although FAA's Flight Standards office oversees the process for developing procedures by FAA and third parties, it does not have the authority to enforce penalties for non-compliances that it finds with the procedures developed internally by FAA employees. That authority lies within the Air Traffic Safety Oversight Division. As shown in table 2, several offices within FAA's Aviation Safety and Air Traffic organizations play a role in ensuring the safe development and integration of new flight procedures into the NAS.

Table 2. Roles and Responsibilities in the Development and Oversight of Flight Procedures

FAA Office	Responsibilities
Air Traffic Organization	
RNAV/RNP Group	• Implements and integrates RNAV and RNP routes and procedures into the NAS
Aviation System Standards	• Designs and develops public and special instrument flight procedures (IFP) • Operates a fleet of flight inspection aircraft for airborne evaluation of IFPs and maintains public procedures
Air Traffic Facilities	• Evaluate and use the procedures operationally • Train controllers on new procedures
Aviation Safety	
Flight Standards Service	• Develops and evaluates design criteria for IFPs • Oversees flight inspection policy and all IFP development, both FAA and third-parties • Approves special procedures • Enforces non-compliance penalties for procedures developed by third parties
Air Traffic Safety Oversight Services	• Independently oversees the Air Traffic Organization • Audits Air Traffic facilities, including the Aviation System Standards (office that develops instrument flight procedures) • Enforces non-compliance penalties for procedures developed internally

FAA cannot effectively determine its oversight staffing needs because the extent that airlines will use third parties is unknown. FAA officials told us that staffing of 14 personnel in its oversight office is currently sufficient; however, it has yet to authorize the two third parties for developing RNP procedures or determine the demand for their services. If FAA increases the number of procedures produced each year, it will have to reassess staffing needs.

CONCLUSIONS AND ACTIONS NEEDED TO ENSURE SAFE AND EFFECTIVE IMPLEMENTATION OF RNAV/RNP

NextGen is an important initiative to enhance capacity, reduce delays, and fundamentally change the way air traffic is managed, and RNAV and RNP are critical to its success. Nearly 40 percent of the 123 operational improvements under review by a joint Government/industry taskforce on NextGen involve RNAV/RNP. Yet, FAA has not fully laid the groundwork in areas such as developing RNP procedures that provide measurable benefits, ensuring air traffic policies keep pace with new aircraft technology, and making the necessary adjustments to air traffic control systems to accommodate these new procedures. In addition, because FAA has not clearly defined the roles and responsibilities of third parties, it will be difficult to establish an effective oversight framework

We look forward to the task force's recommendations by the end of this summer and will work with FAA and Congress to continually monitor the following areas to ensure successful implementation of RNAV/RNP.

- Aligning FAA's flight plan goals with producing *quality* RNP procedures that have significant benefits rather than focusing on the number of procedures.
- Establishing priorities for new routes and funding requirements for related airspace redesign projects and systems that controllers rely on to manage traffic.
- Performing cost-benefit analyses in close coordination with all stakeholders before and after implementing RNP procedures.
- Ensuring air traffic controllers and pilots are aware of and trained on procedures before they are implemented.
- Developing and establishing a policy on how and to what extent third parties will be used to help support FAA's NextGen efforts and ensure an effective oversight approach.

Mr. Chairman, this concludes my prepared statement. I would be happy to address any questions that you or other Members of the Subcommittee may have.

U.S. House of Representatives
Committee on Transportation and Infrastructure

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

Washington, DC 20515

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

July 31, 2009

Ms. Ann Calvaresi-Barr
Principal Assistant Inspector General
for Auditing and Evaluation
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Dear Ms. Calvaresi-Barr:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
MS. ANN CALVARESI-BARR
PRINCIPAL ASSISTANT INSPECTOR GENERAL
FOR AUDITING AND EVALUATION
U.S. DEPARTMENT OF TRANSPORTATION

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

RNAV/RNP Questions for the Record
Congressman Michael E. McMahon

Question 1: I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

Answer: We have highlighted a number of areas that will help FAA better define NextGen. These actions include setting budget priorities, establishing firm requirements, and determining the skill mix and expertise necessary to manage and develop NextGen.

Congress should provide aggressive oversight of NextGen efforts to ensure that the FAA can deliver NextGen capabilities. A particular watch item for Congress and decision makers is the pending results of an industry/government task force that is examining NextGen goals that can be accomplished in the near term. This task force is expected to make recommendations to help FAA prioritize efforts, frame the business case for new systems (for FAA and airspace users), and define the necessary actions to achieve benefits. According to FAA and industry representatives, the task force is on track to complete its work in September. The Congress will need a full understanding of how the task force recommendations will impact FAA's plans and budgets for both capital and operating accounts over the next 2 - 3 years.

Question 2: In your view, are we adequately funding all aspects of the NextGen initiatives?

Answer: In fiscal year 2009, Congress demonstrated its support for revamping the Nation's air transportation system by providing FAA with $638 million for NextGen and related activities. FAA has requested over $800 million for various NextGen efforts in its FY 2010 budget. We cannot determine whether funding profiles for NextGen are adequate because FAA has not established firm requirements for adjustments to existing systems or new acquisitions. According to FAA, the Agency may be 1½ to 2 years away from having reliable requirements that can translate into cost and schedule baselines for NextGen efforts.

STATEMENT OF RICHARD L. DAY, SENIOR VICE PRESIDENT FOR OPERATIONS, AIR TRAFFIC ORGANIZATION, FEDERAL AVIATION ADMINISTRATION, ON NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED NAVIGATION PERFORMANCE (RNP), BEFORE THE HOUSE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE, SUBCOMMITTEE ON AVIATION, JULY 29, 2009.

Chairman Costello, Congressman Petri, and Members of the Subcommittee:

Thank you for inviting me here today to discuss the Federal Aviation Administration's program for area navigation (RNAV) and required navigation performance (RNP) air traffic control routes. RNAV/RNP is a building block for the Next Generation Air Transportation System (NextGen), and has already shown great promise in enhancing safety and efficiency in the National Airspace System (NAS).

Through NextGen, the FAA is addressing the impact of air traffic growth by increasing NAS capacity and efficiency while simultaneously improving safety, reducing environmental impacts, and increasing user access to the NAS. To achieve its NextGen goals, the FAA is implementing new Performance-Based Navigation (PBN) routes and procedures that leverage emerging technologies and aircraft navigation capabilities.

What is Performance-Based Navigation?

PBN is a framework for defining performance requirements in "navigation specifications," that is, to specify that the avionics can function in a particular way or ways, that the pilot is appropriately trained and follows certain procedures in the cockpit. PBN can be applied to an air traffic route, instrument procedure, or defined airspace. PBN provides a basis for the design and implementation of automated flight paths as well

as for airspace design and obstacle clearance. Once the required performance level is established, the aircraft's own capability determines whether it can safely achieve the specified performance and qualify for the operation.

What Is RNAV?

Prior to satellite navigation capabilities, i.e. global positioning systems or GPS, aircraft could only navigate primarily by ground-based navigation aids, such as VHF Omni-directional Range (VOR) equipment. This limited the routes that aircraft could take, depending on the location and position of those ground-based aids, and necessarily involved certain inefficiencies during flight, e.g., instead of flying a direct route, an aircraft might have to take a more circuitous route in order to navigate from ground-based point to ground-based point.

Now, with advances in technology, we are able to take advantage of space-based navigation sources that provide for additional navigational coverage. An aircraft using RNAV can fly on any desired flight path within the coverage of ground- or space-based navigational aids, within the limits of the capability of the systems onboard the aircraft, or a combination of both capabilities. As such, RNAV aircraft have better access and flexibility for point-to-point operations. This leads to the potential for flights to reduce the miles flown, save fuel, and enhance efficiency.

RNAV also helps solve operational issues. For example, an RNAV approach may be available in areas where we cannot install or maintain a ground-based navigational aid,

such as in Alaska, where the terrain either does not permit the ability to install the navigational aid or the weather conditions preclude us from being able to maintain the operability of the navigational aid.

What Is RNP?

RNP is RNAV with the addition of an onboard performance monitoring and alerting capability. A defining characteristic of RNP operations is the ability of the aircraft navigation system to monitor the navigation performance it achieves and inform the crew if the requirement is not met during a flight operation. This onboard monitoring and alerting capability enhances the pilot's situational awareness and can enable reduced obstacle clearance or closer route conformance without intervention by air traffic control.

Certain RNP operations require advanced features of the onboard navigation function and approved training and crew procedures. These operations must receive approvals known as Special Aircraft and Aircrew Authorization Required (SAAAR), similar to approvals required for operations to conduct Instrument Landing System Category II and III approaches. In addition to certified avionics, the flight crew must be trained and authorized to fly these complex procedures.

The attached chart shows how RNAV and RNP have improved the navigational process. See Figure 1 below. As you can see, using the current ground navaids, the aircraft has to fly from beacon to beacon, often taking an inefficient route in order to pick up the signals at the appropriate place in the air. The dotted boxes indicate the expanse of the area in

the sky that the aircraft could be in as it picks up those ground-based signals. This requires our air traffic control to create larger areas of separation between aircraft, in order to maintain safety. In the RNAV and RNP routing, however, the dotted areas are far smaller, indicating that the aircraft can fly a much more precise route in the air. Additionally, the graphic illustrates the RNP "radius to turn" ability, essentially indicating how RNP enables the aircraft to make much tighter, more precise turns in the air. This is particularly useful in areas where the airspace is congested and there are multiple busy airports. The ability of the aircraft to use these "radius to turn" procedures means air traffic is easier to "deconflict," or route in a manner that avoids other air traffic paths.

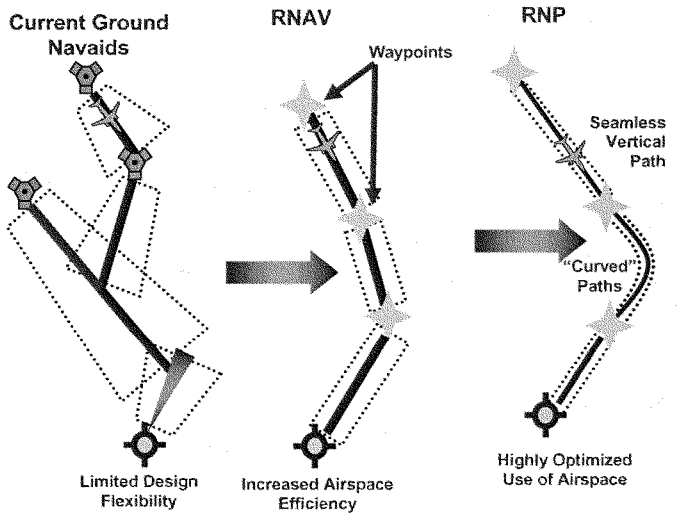

Figure 1. Performance-Based Navigation: RNAV/RNP

Benefits

RNAV and RNP capabilities facilitate more efficient design of airspace and procedures which collectively result in improved safety, access, capacity, predictability, and operational efficiency, as well as reduced environmental impacts. Specifically, improved access and flexibility for point-to-point operations help enhance reliability and reduce delays by defining more precise terminal area procedures. They also can reduce emissions and fuel consumption.

RNAV procedures can provide benefits in all phases of flight, including departure, en route, arrival, approach, and transitional airspace. For example, Standard Terminal Arrivals (STARs) can:

- Increase predictability of operations
- Reduce controller/aircraft communications
- Reduce fuel burn with more continuous vertical descents
- Reduce miles flown in Terminal Radar Approach Control (TRACON) airspace
- Reduce interaction between dependent flows in airspace shared for adjacent airport operations.

How are RNAV/RNP Procedures Created?

RNAV/RNP procedures have been developed by the FAA, with the support of industry and MITRE, in a complex, multi-layered process. For Terminal RNAV procedures (those RNAV procedures in the airspace into an airport terminal environment), for example, there is an 18-step implementation process. See Figure 2 below.

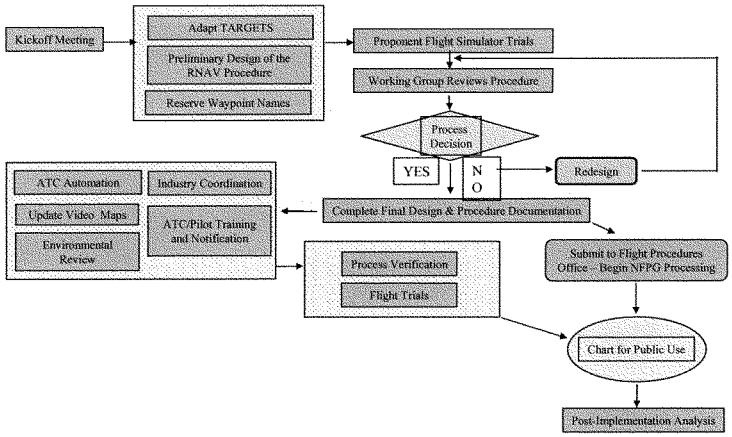

Figure 2. 18-Step Guidelines for Terminal RNAV Procedure Implementation

Several offices within the FAA play essential roles in the development of these procedures. Their various duties are outlined below:

Air Traffic Organization:

RNAV/RNP Group

- Serves as the lead office for implementation and integration of RNAV and RNP routes and procedures into the air traffic environment
- Coordinates policy and implementation activities with industry and within FAA
- Provides guidance for and expedites the development of PBN criteria and standards and implements airspace and procedure improvements
- Collaborates with the U.S. and international aviation communities – government and industry – as a leader in developing PBN concepts, technical standards, operator requirements, and implementation processes to enhance safety, increase capacity, improve efficiency, and reduce the environmental impact of aviation
- Provides technical and operational guidance within FAA. This group also develops and maintains processes and tools to aid the field with RNAV/RNP procedure design

Aviation System Standards

- Oversees the standard development, evaluation, and certification of airspace systems, procedures, and equipment
- Designs and develops instrument flight procedures (IFPs), publishes aeronautical charts and digital products for air carrier and general aviation pilots for use throughout the United States and around the world
- Provides aircraft maintenance and engineering services, operates a fleet of flight inspection aircraft for airborne evaluation of IFPs and electronic navigational signals

Field Facilities

- Responsible for procedure design evaluations for airspace and procedures usage, letters of agreement, video map updates, automation coding and controller familiarization and training in accordance with the 18-step RNAV implementation process
- Responsible for designing and using the procedures operationally

Aviation Safety:

Flight Standards Service

- Develops and establishes criteria for civil and military terminal instrument procedures
- Develops rules, standards, policies, and criteria governing the operational aspects of en route, terminal, and instrument flight procedures (except air traffic control procedures)
- Performs operational evaluations, including flight simulation, flight simulator, and in-flight testing of standards and criteria
- Assesses the impact on safety and provides radar separation analysis tools
- Oversees all of flight inspection policy and all instrument flight procedure development

Aircraft Certification

- Administers safety standards governing the design, production, and airworthiness of civil aeronautical products, such as the avionics required for RNAV/RNP
- Oversees design, production, and airworthiness certification programs to ensure compliance with prescribed safety standards
- Provides a safety performance management system to ensure continued operational safety of aircraft
- Works with aviation authorities, manufacturers, and other stakeholders to help them successfully improve the safety of the international air transportation system

Air Traffic Safety Oversight Service

- Establishes safety standards and provides independent oversight of the Air Traffic Organization – the provider of air traffic services in the United States
- Accomplishes safety oversight in a variety of ways including:
  - Developing and amending regulations and guidance for regulatory oversight and credentialing functions
  - Participating in the development and harmonization of air traffic control international standards
  - Providing regulatory oversight of the Air Traffic Organization Safety Management System

What Is the Status of RNAV/RNP?

Currently, we have 159 RNAV routes and 270 RNAV arrival and departure procedures implemented into the NAS and 163 RNP SAAAR approach procedures. By the end of fiscal year 2009, we anticipate that we will have an additional 48 RNAV routes, 35 RNAV arrival and departure procedures, and 29 RNP SAAAR approach procedures in place. Additionally, other PBN procedures such as Localizer Performance with Vertical Guidance approaches throughout the NAS elevate the overall number of Performance Based Procedures to over 8,000.

What Are the Challenges of RNAV/RNP?

The development of RNAV/RNP procedures is a relatively young program at the FAA. The agency only began developing these procedures in 2002. Along the way, we have encountered some challenges and learned from them. We intend to apply those lessons moving forward.

While we have a standard process for developing RNAV/RNP procedures in the Terminal area, we did not have a comparable process for developing procedures elsewhere in the operational environment. We believe this as an area in which we could improve, and have asked for an agency-wide mapping of all PBN processes to standardize how we develop, test, chart, and implement Performance-Based Navigation procedures. I am pleased to report that we should be starting work on that Process Mapping in the next couple of weeks.

As we move forward, there are other challenges that continue to face us in the advancement of RNAV/RNP. For example:

- International Harmonization: What the FAA terms "RNP SAAAR" (defined above), the bulk of the international community refers to as "RNP AR." As always, we want to make sure that our terms and procedures are harmonized with international standards to reduce confusion and enhance safety. As a result, we are transitioning this term to harmonize with the international community's term. We will continue to work with our counterparts internationally in addressing these types of issues.
- Environmental Issues: While many RNAV/RNP procedures are considered "overlays," that is, following essentially the same flight path that air traffic follows today, the implementation of some RNAV/RNP procedures will trigger the need for a detailed quantitative environmental review because the location and number of proposed flight paths may be different from what currently exists. The FAA has a strong commitment to environmental stewardship and doing our best

- Hybrid Environment: As the aviation industry moves towards equipping their aircraft to take full advantage of RNAV/RNP benefits, we are bound to see a mix of differing aircraft capabilities in the NAS, flying different types of procedures. This "hybrid environment" will certainly present additional challenges to our controllers, but we are fully confident that they will be able to handle these challenges as we deploy decision support tools, technology, and training. Because equipage remains a challenge to some in the aviation community, the FAA is committed to providing a safe environment in the NAS for all users.
- Third-Party Development: There are several third-party vendors available who are capable of developing RNAV/RNP procedures for specific projects. We are working with two of them (Naverus and Jeppesen) to authorize them to do procedure development, flight validation, and maintenance of Public RNP SAAAR instrument approaches, under FAA supervision. However, the safety of the NAS is the FAA's mission and responsibility. When we do use these third-party resources, FAA is committed to overseeing their work to ensure safe development and implementation into the NAS. We will not abdicate our responsibility to assure safety.

- Prioritization of Procedures: As the benefits of RNAV/RNP become clearer to users of the NAS, we have received increasing requests to add or accelerate new RNAV/RNP procedures more widely in the NAS. The FAA certainly appreciates the validation of our work, but we caution that implementation of new procedures into the NAS must be done carefully and methodically to ensure a cohesive system. Moreover, as the RNAV/RNP program matures, we are discovering that certain procedures may provide greater benefits for industry, the flying public, and the NAS overall. Safe and effective integration of these procedures are of paramount importance to the FAA, and as such, we are working to deploy them in a manner that will maximize the benefits of RNAV/RNP.

Some of our other technical challenges are illustrated in the graphic below. See Figure 3.

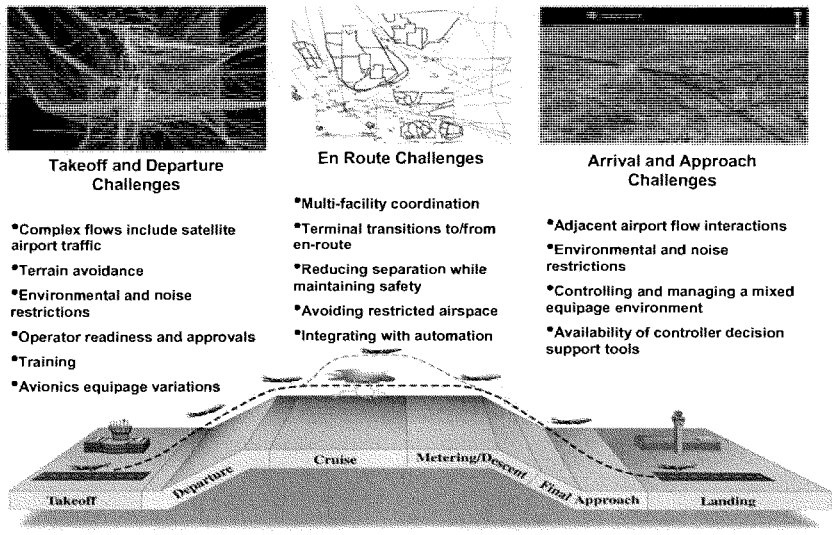

Figure 3. RNAV/RNP Implementation and Challenges

Conclusion

As you can see, the FAA has developed a solid foundation of routes and procedures for RNAV/RNP, which serves as a platform of the enhanced safety and efficiency goals of NextGen. Since we have this foundation, we are transitioning from a site-by-site (or runway-by-runway) implementation process toward a NextGen readiness concept that would include development of an integrated system of PBN routes and procedures NAS-wide. This broader view will go further in advancing NextGen and better accommodate our intent to accelerate NextGen as much as possible. In the end this integrated approach will optimize benefits for operators, and ultimately, the traveling public. While we anticipate challenges along the way, we have learned from our work over the past few years and are prepared to meet those challenges effectively.

Mr. Chairman, Ranking Member Petri, Members of the Subcommittee, this concludes my prepared remarks. I would happy to answer any questions you may have.

U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

July 31, 2009

Mr. Richard L. Day
Senior Vice President for Operations
Air Traffic Organization
Federal Aviation Administration
800 Independence Avenue, SW
Washington, D.C. 20591

Dear Mr. Day:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry Costello

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
MR. RICHARD L. DAY
SENIOR VICE PRESIDENT FOR OPERATIONS
AIR TRAFFIC ORGANIZATION
FEDERAL AVIATION ADMINISTRATION

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
NEXTGEN: AREA NAVIGATION (RNAV)/
REQUIRED NAVIGATION PERFORMANCE (RNP)

RESPONSES TO
QUESTIONS FOR THE RECORD
FROM CONGRESSMAN MCMAHON TO
MR. RICHARD L. DAY
SENIOR VICE PRESIDENT FOR OPERATIONS
AIR TRAFFIC ORGANIZATION
FEDERAL AVIATION ADMINISTRATION

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

Response:

The FAA continues to identify potential opportunities to accelerate the deployment of NextGen capabilities and to begin to deliver additional benefits by 2012 while minimizing risk. The proposal FAA is currently developing builds on existing NextGen plans, which are already undergoing acceleration. Planned fiscal year 2009 and 2010 budget requests reflect significant acceleration of NextGen projects from previous years.

Achieving the full capability of NextGen benefits will require investment by both the government and the private sector. Ensuring that a significant portion of the aircraft fleet is appropriately equipped to take advantage of NextGen improvements is one of the most critical issues in achieving success. The greatest risk to the success of NextGen operational improvements is the inability of operators to equip their aircraft with corresponding avionics. The FAA is working with the NextGen Implementation Task Force on consensus recommendations for accelerating equipage and the FAA will continue to monitor these results to determine what actions are necessary.

The FAA appreciates the continued support for NextGen and stands ready to work with Congress on the implementation but we have no specific suggestions at this time for congressional action.

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

Response:

Yes. The FAA has requested approximately $6.9 billion in NextGen funding over the next 5 years (FY 10 – FY 14) with approximately $865 million for FY10. The funding for FY09 is $695 million, a significant increase of $483 million (or 227 percent) over the $212 million enacted for the program in FY 2008 levels. This funding is required to keep NextGen on track with the FAA's published Implementation Plan and is necessary to achieve the mid-term capacity and environmental goals integral to the National Airspace System mid-term architecture.

Statement of

CHET FULLER
President – GE Aviation Systems, Civil

Before the

AVIATION SUBCOMMITTEE
Committee on Transportation and Infrastructure
U. S. House of Representatives

Hearing on

NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)

Wednesday, July 29, 2009

Mr. Chairman, Members of the Committee, I am Chet Fuller, President – GE Aviation Systems, Civil. Thank you for the opportunity to testify before the Subcommittee today on the issue of Area Novigation (RNAV)/Required Navigation Performance (RNP), an issue central to the discussion on NextGen, the modernization of our nation's air traffic control system.

Today I will share with you four main points:

- *First* – RNP means greater accuracy and precision and RNP enables efficiency. It is through RNP that operators and the flying public derive the value of NextGen Air Traffic Management.
- *Second* – RNP saves time, it saves fuel, it reduces Carbon emissions, and it reduces community noise on both approach and departure.
- *Third* – RNP is fundamental to the transition from the past - ground-based, voice controlled air traffic - to the future – time and space based, digitally controlled management, otherwise known as NextGen's 4 Dimensional Trajectory Based Operations.
- *And Fourth* – The technology is ready today; all we have to do to reap the benefits of RNP is accelerate its implementation.

GE Aviation is a leader in efficient technology

From the turbo supercharger to the world's most powerful commercial jet engine, GE's history of powering the world's aircraft features more than 90 years of innovation. Our innovation is not limited to aircraft engines; GE's Aviation Systems business is a leading global provider of electrical power systems, avionics, actuation and landing gear, aerostructures and propeller systems. GE - Aviation's technological excellence, supported by continuing substantial investments in research and development, has been the foundation for growth, and helps to ensure quality products for customers.

For more than two decades, GE Aviation's navigation systems have guided the world's most successful air transport aircraft, racking up more than 130 million hours of operation on Boeing 737 and Airbus A320 family aircraft, while providing unprecedented levels of safety and efficiency. In fact, every 2.7 seconds an aircraft takes off with GE's Flight Management System (FMS). GE's leadership has resulted in advancements that support NextGen and ATM including:

- First to demonstrate RNP operations at 0.1nm with Alaska Airlines into Juneau, Alaska in the 90s;
- First to extend RNP to 4-Dimensional Trajectory Based Operations (4D TBO) in revenue service with Scandinavian Airlines;
- Playing an integral part in Southwest Airlines' plans to begin RNP operations with our large area displays and FMS.
- Supplying National Airspace capable systems to the US military.

Ecomagination

Ecomagination is a GE business initiative to help meet customers' demand for cleaner and more energy-efficient products and to drive reliable growth. Ecomagination reflects GE's commitment to invest in a future that creates innovative solutions to environmental challenges and delivers valuable products and services to customers while generating profitable growth for the company.

Our efficient product designs alone do not bring benefits to aircraft. The products must be integrated into the aircraft and, important in the context of air traffic management, must be operated efficiently. Our ecomagination certified FMS Optimized Descent provides operational efficiency to our customers in conjunction with the air traffic management system.

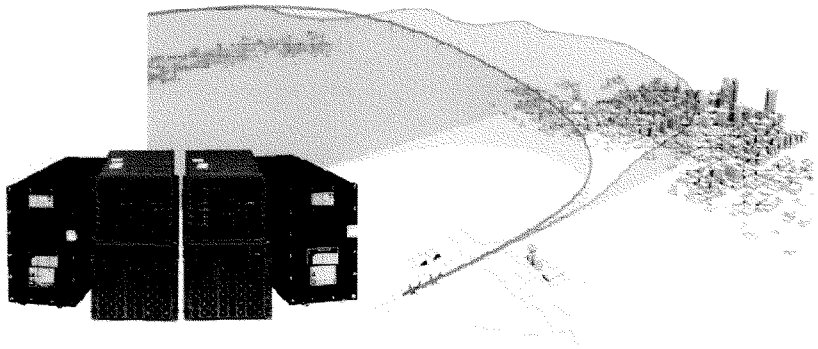

Figure 1. GE Aviation's Flight Management System Optimized Descent is an ecomaginotion product

The Need for Air Traffic Modernization

Our current Air Traffic Control (ATC) system is outdated, relying on a 1960s era infrastructure. The most efficient airways are constrained by ground-based radar systems and navigational aids, constraining aircraft to a few crowded "highways in the sky" rather than using the full airspace available. As a consequence, today's modern aircraft are forced to fly much farther than necessary due to long, wide turns and radar vectoring when "entering" and "exiting" these highways in the sky.

Moreover, aviation is quickly approaching the capacity limits of our current ATC system. The Congressional Joint Economic Committee calculated air traffic delays to cost the U.S. economy $41 billion in 2007[1]. Despite the current short-term decline in air traffic, the long-term air traffic demand is forecast to continue growing. Our current system of voice-control simply will not be able to keep up with this growth and meet the anticipated demand. The key to achieving growth without further adverse impact on the economy is the ability to accommodate more flights, while maintaining safe distances between aircraft. Improvements in accuracy and integration are critical so our system can keep up with forecasted demand even as we reduce aviation's environmental footprint.

4 Dimensional Trajectory Based Operations - the Solution

Government and industry have reached general agreement that the solution to air traffic management is to build on RNP to achieve 4D Trajectory Based Operations. 4D TBO relies on a few key concepts:

- Navigation: Extend RNP performance to all four dimensions
- Communication: Data link for trajectory negotiation
- Integration: Ground capability to manage and de-conflict the trajectories of various aircraft

4D TBO, often referred to as 4D RNP, truly builds on current RNP technology by extending the performance requirements to the vertical and time dimensions. The most efficient, conflict-free route from take-off to landing is communicated and agreed upon between the aircraft and controller. The aircraft is capable of precisely following this trajectory in all four dimensions, and can meet assigned arrival times with a precision of mere seconds throughout the flight. With 4D TBO the ATC system is capable of managing aircraft by their trajectories, and takes advantage of the precise navigation capabilities of the aircraft to ensure all trajectories are free of conflicts with other aircraft. In this system aircraft are provided access according to a "best equipped, best served" policy.

Needed improvements are already being implemented in other parts of the world, and are close at hand here in the U.S. RNAV/RNP procedures are an important and

[1] Your Flight Has Been Delayed Again – Flight Delays Cost Passengers, Airlines, and the U.S. Economy Billions, Joint Economic Committee Majority Staff, Chairman – Senator Charles E. Schumer, Vice Chairman – Representative Carolyn B. Maloney, May 2008

necessary element of the overall solution to transition from current operations to a 4D TBO system. Rapidly creating RNAV/RNP procedures that address the airlines' needs for efficiency, the air traffic system's need for safety and capacity and the overall need for emission reductions is a critical step. GE recommends that we move forward rapidly and efficiently on the deployment of well designed RNAV/RNP procedures while keeping in mind that the overall solution in NextGen requires all the elements described above to enable 4D TBO.

Next, I will provide an overview of RNAV and RNP and will discuss their benefits.

RNAV/RNP Technology

As stated earlier, our airspace has been allocated and flight routes defined based on a post-WWII infrastructure of ground-based navigation aids (e.g. VOR, DME, NDB, ILS) limiting aircraft to routes and procedures – or "roadways" - defined by the location of these aids and requiring aircraft avionics sensors specific to each. Due to the location and accuracy of these aids, aviation routes and procedures based on this infrastructure are longer and farther apart than necessary with today's technologies. This creates congestion and delays the impact of which goes beyond the obvious environmental impacts to the overall efficiency of the US economy as businesses feel the cost of these delays (for instance through reduced productivity, work stoppages due to late shipments or loss of revenue due to spoiled goods). With today's advanced navigation technologies - RNAV and RNP - aircraft are capable of safely flying along shorter and more efficient routes.

What is RNP/RNAV?

RNAV is navigation using earth coordinates of latitude and longitude to define the aircraft route and position. Because the aircraft is no longer constrained by the limitations of ground-based navigation aids, point-to-point routes can be defined in a more flexible manner. RNP builds on RNAV by adding performance requirements to the system to ensure the aircraft flies the route within a specified accuracy, referred to as containment. Requirements on the integrity of the navigation system and continuity of its operation provide a high-level of predictability and confidence to the air traffic controller that the aircraft will fly the exact RNP route with no system failures.

Because RNP-capable aircraft can fly such precise, repeatable flight paths, RNP procedures can be:

- defined anywhere to avoid constraints (e.g. mountains, towers, noise sensitive areas, etc.) where conventional procedures cannot,
- shorter and more direct routes,
- closer together due to the containment to a defined path, increasing airport capacity and also de-conflicting traffic between nearby airports

Rather than requiring a specific set of ground and air equipment, RNP authorization specifies different levels of performance requiring different types of equipment, where the lower the RNP value the more stringent the accuracy requirements. In

addition to equipment, RNP procedures with Authorization Required (AR) may also require specific crew training procedures. As a result, airlines can choose the type of equipment and training needed for their particular operations.

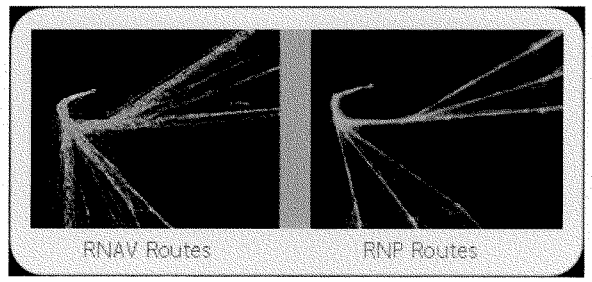

Figure 2. RNP Flight Paths provide even tighter containment, integrity and continuity than RNAV Flight Paths alone

Why is RNP essential for NextGen?
RNP is revolutionary in that it opens the door for varying airspace allocation based on the equipped capability of the aircraft. Expanding the concepts of RNP and defined performance levels to the vertical profile and estimated arrival times is a key component of NextGen's 4D TBO concept. In today's system, ATC has little knowledge of when and where the aircraft will enter a controller's sector, often requiring ATC to intervene with a flight to maintain separation between aircraft, control the flow within the sector or meter aircraft to the final approach. By exchanging the aircraft's 4D Trajectory generated by the FMS periodically throughout the flight, controllers have accurate and timely knowledge of when and where aircraft will enter their airspace and the performance limits of the trajectory. In NextGen, this improved predictability will move the current air traffic system from one of "control" to one of "management". Implementation of procedures to take advantage of existing RNP technology is a key enabler for this NextGen concept.

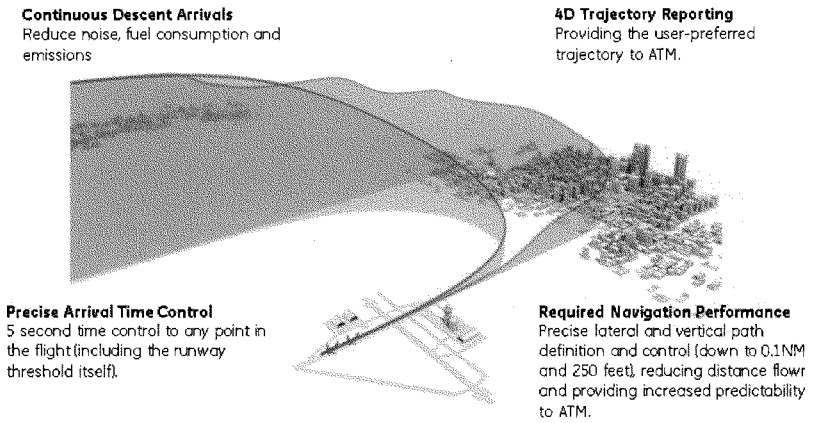

Figure 3. RNP is the Basis for NextGen's 4D Trajectory Based Operations (TBO)

RNP Benefits

There are many benefits of RNAV/RNP to the users of the ATM system, to the air traffic controllers themselves, and to society as a whole. RNP can help aircraft operators reduce flight time and save fuel, and can increase airspace capacity to accommodate the forecasted aviation growth in an environmentally responsible manner. Accelerating RNP implementation also provides economic benefits and will help the U.S. maintain its global lead in the aviation industry.

Environment

RNP is environmentally friendly. By providing flexible routing using satellite navigation, operators are no longer constrained to flying over ground stations. As a result, aircraft are able to fly the most efficient route in the shortest distance, saving both time and fuel and lowering emissions. It is estimated that these shorter routes have the potential to cut global CO2 emissions by about 13 million metric tons per year[2], representing 1.8% of 2008 global aviation CO2 emissions[3]. This includes 2 million tons at the top 10 U.S. airport communities alone[4]. The shorter flight distance and optimized engine settings made possible by RNP also reduce the noise during landing significantly, and the precise, flexible routing can avoid noise-sensitive areas, such as residential communities, altogether. When combined with optimized profile descents RNP facilitates lower, quieter engine thrust levels, further reducing fuel, noise and emissions.

Use of RNP procedures during the departure phase of flight also yields the opportunity for more reduced thrust operations during takeoff. Reduced thrust

[2] Meeting Aviation Challenges Through Performance Based Navigation, ICAO/IATA
[3] IATA growth estimates, eia.doe.gov, iea.org, atag.org
[4] Energy & Environmental Benefits, New Procedures Significantly Reduce Noise & Emissions, Honeywell

takeoffs provide increased engine life due to lower rotational pressure and heat loads. Over the long run this produces an engine with better fuel burn. The flexible and precise routing RNP provides combined with lower thrust levels on takeoff can also significantly reduce the number of people adversely affected by noise from departing aircraft.

There is no reason to wait to develop RNP procedures; RNP is being implemented around the world today, with immediate benefits. In Brisbane, Australia, Qantas has been the lead carrier in the Brisbane Green RNP Project since 2007, a program of particular interest to observers in the U.S. This project has clearly demonstrated that air traffic controllers can integrate RNP capable aircraft and non-RNP capable aircraft in a medium traffic density airport environment to create immediate reductions in CO2, fuel burn and noise. Qantas has already implemented RNP procedures at 15 Australian airports, and AirServices Australia recently announced that it will be working with a third-party RNP procedure designer to produce a nationwide network of public-use RNP procedures at all major Australian airports. This effort is expected to reduce CO2 emissions more than 122,000 metric tons (269 million lbs) per year and reduce fuel consumption by nearly 13 million gallons a year[5].

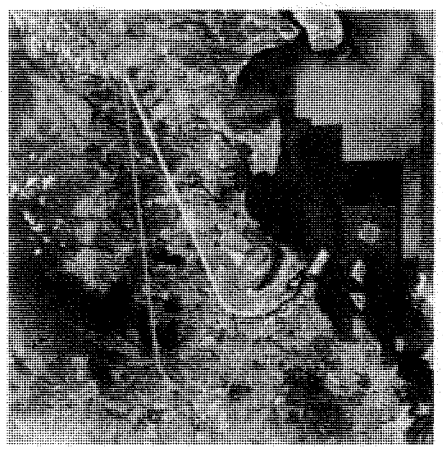

Figure 4. The Flight Path for the RNP (green) arrival in Brisbane is much shorter than the Traditional (red) arrival, reducing fuel and emissions.

As an initial step here in the U.S., Southwest Airlines is committing $175 million to implement RNP across its fleet of Boeing 737s. A roundtrip demonstration flight earlier this year between Dallas Love Field and Houston Hobby using RNP procedures yielded a 0.41 metric ton (904 lb) CO2 savings for the one flight alone[6].

[5] AirServices Australia estimates that are extrapolated from current operations.
[6] Figures published by Southwest Airlines.

The extension of RNP to time in 4D TBO is critical to unlocking additional efficiency. In Europe, Scandinavian Airlines has been using time-based operations to significantly reduce their operating costs and help to reduce their carbon footprint. In over 4,000 such approaches into Stockholm, the airline has seen an additional fuel savings of 77,350 gallons (240,000 kg), CO2 reduction of 756 metric tons, NOx (nitrogen oxide) reduction of 2.64 metric tons annually and noise reduction by 50 percent (65db) for the exposed area[7]. The increased predictability of time-based operations and ability to negotiate the optimal trajectory provides significant savings in addition to those available from RNP.

Multiple studies have shown that a typical narrow-body plane utilizing GE's FMS Optimized Descent could save between 32 and 65 gallons of jet fuel per descent compared to a traditional stepped-down approach, reducing fuel, CO2 and NOx emissions an estimated 6-12 percent. In addition, studies have shown that a typical narrow-body plane utilizing GE's FMS Optimized Descent reduces -- by up to 22% -- the land area impacted by noise levels greater than 60 dB. In fact, an average sized fleet of thirty 737 New Generation aircraft flying an optimized descent with an RNP approach only 50% of the time would result in a CO2 reduction equivalent to removing 1,500 cars from U.S. roads, or the amount of CO2 absorbed by over 2,200 acres of southeastern US forest per year.

Capacity and Safety

RNP can also improve safety and capacity by providing a precise lateral and vertical flight path in areas of difficult terrain or congested airspace. Alaska Airlines reportedly chose Juneau for the first RNP flight path in 1996 due, in part, to the operational difficulty of landing or departing the airport during periods of low ceiling and reduced visibility. Building on the success of RNP at Juneau, the airline has gone on to develop additional RNP procedures at other airports which has saved millions of dollars in avoided diversions.

The use of RNP also provides benefits to air traffic controllers. Air traffic controllers in Australia have noted that the predictability and accuracy of aircraft flying RNP have made their jobs easier. Because aircraft flying RNP procedures track the desired course to very tight tolerances, day and night, wind or no wind, rain or shine, controllers have a high degree of confidence that aircraft will perform according to expectations. We expect controllers in the U.S. to have the same positive experiences as those in the rest of the world.

Economic

We must also consider the economic impact of accelerating the integration of RNP procedures into the National Airspace as opposed to further delays in aviation modernization. The U.S. has historically been the global leader in aviation technology. Last year civil aviation accounted for 11 million jobs and $1.2 trillion in economic

[7] Figures published by Scandinavian Airlines as part of NUP2+ project.

activity - 5.6% of the U.S. Gross Domestic Product (GDP). Moreover, the U.S. aerospace industry contributed $61 billion in net exports in 2007[8].

The savings available from use of RNP and 4D TBO could represent 7-12% of an airlines' fuel cost; these types of fuel savings would go a long way in re-establishing the health of the airline industry. Saving these significant amounts of fuel would also contribute an important step in the path to foreign oil dependence. Implementation of these technologies also presents the opportunity for an additional 5-10% savings in maintenance costs, which is one of the top 5 costs for an airline.

RNP is a technology that is ready to be implemented here in the U.S. and can provide significant environmental, fuel efficiency and capacity benefits. The Air Transport Association of America has estimated a cost of only $683 million to equip the entire U.S. air transport fleet for RNP operations[9]. This cost should be offset in a matter of months when potential efficiency gains and reduction in delays become reality. In comparison, to achieve the efficiency gains equivalent to RNP operations via engine and airframe modifications, is estimated to cost well in excess of *$10 billion* in research and development with a much longer time-frame for fleet integration.

With the technology already available, RNP procedure development is the obvious place to begin immediately. We can build on this to implement 4D TBO, where RNP will be extended to the vertical and time dimensions. As the historical leader in aviation, the U.S. is the logical place to create these products and services for our benefit and to be exported around the globe.

Challenges

In implementing RNP in the United States, we have to be aware of some of the potential pitfalls, such as unfocused investments, procedure design issues and the regulatory system. We must also keep in mind that RNP is a step along the road to a greater NextGen system of 4D TBO.

"Stovepipe" investments

For years, the aviation industry has categorized the aviation system's capabilities into three separate bins, or "stovepipes":

- Communication - ability of the aircraft to communicate with the ATC system
- Navigation - ability of the aircraft to progress along the most efficient path
- Surveillance - ability of ATC to know where the aircraft is now

While this has been useful it has also led to isolation of these functions from each other. The FAA's NextGen Implementation Plan rightly points out the need for an "Integrated Mid-Term Capability" to successfully attain NextGen benefits. However, investment tends to focus on these functions individually and not on their integration.

[8] The Economic Impact of Civil Aviation on the Economy, FAA, October 2008

[9] The Case for NowGen: The Right Answer for Our Economy and Our Environment, ATA, April 2009

We are discussing RNP today, which is clearly a "Navigation" capability. RNP produces noteworthy benefits alone as discussed already. However, the most important benefits come when these individual stovepipes are eliminated and integration via 4D Trajectory Based Operations is pursued with vigor.

The NextGen path to 4D Trajectory Based Operations combines the Navigation, Communication and Surveillance capabilities to deliver new levels of predictability and efficiency for controller and pilot alike. The hopes of capacity improvement, benefits of emissions and noise reduction, and increased safety depend on progressing to 4D TBO which, in turn, relies on efficient RNP operations and procedures deployment. The implementation of RNP and the transition to 4D TBO needs to be managed in a focused, integrated manner.

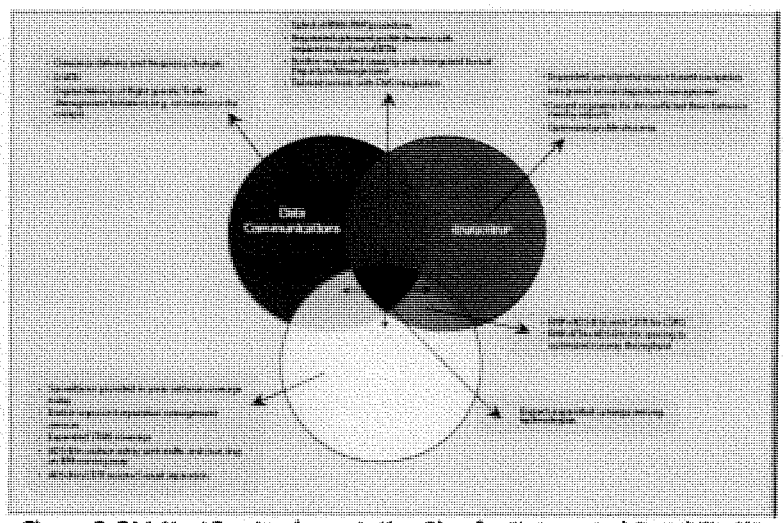

Figure 5. FAA NextGen Implementation Plan for "Integrated Capability"[10]

Procedure Design

All RNP paths are not created equal. It is not enough to mandate a set number of RNP procedures in a given year. Unfortunately, many of the RNP procedures published in the U.S. over the last few years have replicated traditional navigation procedures that are already in place, and in so doing create very little benefit. Although RNP is a powerful tool that can unlock fuel savings, CO2 reductions and noise reductions, merely creating an RNP navigation route is no guarantee of capturing this benefit. To achieve this, the constraints of airspace, aircraft performance, adjacent traffic patterns, air traffic control, geographical features, prevailing weather and noise-sensitive areas around the airport must all be

[10] NextGen Implementation Plan, FAA, 2009

considered in the procedure design. RNP allows all these factors to be taken into consideration by a custom designed three-dimensional path that reduces fuel burn and noise impact while increasing aircraft capacity and safety. We support the emphasis on ensuring operational benefits in new RNP procedure design in the Senate's FAA Reauthorization Bill. To make certain we take full advantage of the benefits of RNP we must quantify the true benefits of new procedures and ensure that the investments are spent in a responsible way that provides real benefits to the stakeholders. It is vital that we create metrics to for success and accurately measure the effectiveness of new procedures by their efficiency gains and their acceptance in use.

Rate of Design

Despite the immediate benefits of RNP and the growing demand from U.S. air carriers for navigation that produces those benefits, the process of approving and deploying RNP navigation procedures in the U.S. remains extremely slow. Moreover, as previously mentioned, many of the published RNP procedures have simply been overlays of existing procedures. FAA review and approval of a given original RNP design often takes years, rather than months. It is our understanding that the FAA is working to develop the processes and procedures under which qualified third-parties can design public-use RNP procedures in the U.S. and that those agreements are either complete or nearly complete. This is a key step to accelerate the introduction of RNP procedures in this country that will reduce fuel, noise and emissions, and we hope that further work can be done to streamline the regulatory process and speed the rate of RNP deployment. We believe that this will be a key recommendation of the RTCA NextGen MidTerm Implementation Task Force next month.

Environmental Assessment

One result of designing more efficient RNP procedures is that the aircraft may take a different route than the less-efficient traditional navigation path. Because the RNP path differs from the previous instrument procedure, there is some question whether an Environmental Impact Statement is required to determine the impact of the new RNP paths. While this is a valid concern that ultimately will need to be resolved, there are immediate ways to design beneficial RNP paths without requiring environmental review. In particular, RNP routes can be designed to replicate the routes taken today by aircraft on clear, good weather days, when controllers clear them for a visual approach.

During periods of good weather and clear visibility, when the pilot has the runway in sight, it is a common and widely accepted practice for the air traffic controller to release the pilot from the instrument approach procedure to land the plane at his discretion. Because a pilot who sees the runway can take the most direct and expeditious route to get there, these visual approaches are generally more efficient than corresponding instrument approaches. By studying the historical radar tracks of aircraft that have been cleared for visual approaches, the procedure design can

limit the RNP paths to these areas. In this way, RNP paths can route the aircraft over areas where visual air traffic is already flying, mitigating any potential adverse environmental impact of the new procedure. However, this will require that FAA provide categorical exemptions from environmental review to RNP procedures that overfly existing visual flight paths.

Path forward

Modernization must take place. NextGen will allow the maximum use of the system to keep up with the expected growth in aviation, while also helping aviation reduce its environmental footprint on both noise and emissions. It will significantly contribute to the economic health of the air transport industry, while aiding our path to foreign oil dependence. RNAV/RNP is a critical technology essential for success of NextGen and offers benefits immediately. Moreover, accelerating RNAV/RNP procedure development will pave the way for a larger implementation of 4D Trajectory Based Operations and the associated efficiency and capacity benefits that go along with it.

While there are challenges to achieving this in the U.S., they can be overcome – as is being demonstrated in other areas of the world such as Northern Europe and Australia. To help address these challenges and begin to take full advantage of the benefits RNAV/RNP offers, GE recommends the following:

- *First* – Accelerate the creation of high quality RNP approach and departure procedures immediately.
    - Accelerate the design of RNAV/RNP procedures by utilizing the combined resources of government and industry. There is much RNP work to be done in the U.S. and there are qualified non-governmental third parties with extensive experience who can accelerate the RNP procedures and commercialize the technology so it is available to all airlines and users across the nation.
    - Accelerate the review and approval of RNAV/RNP procedures by streamlining the regulatory process, including providing exemptions from environmental reviews for procedures that overfly existing visuol paths. These visual procedures are the prevalent mode of landing at many airports the majority of the time, and there is no reasonable justification for any other treatment.
- *Second* – Create metrics for success. Measure the effectiveness of new procedures by their efficiency gains and their acceptance in use.
    - Require that RNP procedure development focus on delivering procedures with three dimensional paths that minimize fuel burn and noise impact under the airspace constraints. To take full advantage of the benefits of RNP we must have a measurable way to ensure that new RNP procedures are designed to truly provide benefit to both airlines and controllers.
- *Third* – We need to accelerate movement toward the NextGen vision of 4D TBO, extending RNP to time. This requires a coordinated effort integrating Communications, Navigation and Surveillance.

- Implement a path toward NextGen's 4D Trajectory Based Operations to address the air traffic modernization need, updating controller's decision support tools, such as Arrival Managers, to facilitate these operations. 4D TBO offers the greatest environmental and economic benefits, with a significant increase in capacity as a result of improved accuracy. In order to achieve the full benefits of NextGen, an integrated approach is required where Communication, Navigation and Surveillance are treated as interdependent pieces of the same system – one strategy, one vision, many enablers.

A key step towards full 4D TBO, advanced RNP technology is "shovel ready", and could begin being implemented today. As discussed, RNP procedures are already being widely implemented in other areas of the world. The acceleration of RNP procedure development carries significant environmental benefits while helping to meet the forecast air traffic demand. Moreover, it has economic impacts in terms of minimizing costly delays and maintaining our world-lead in the aviation industry. Other countries such as Sweden and Australia have demonstrated the feasibility of RNP procedures in an environment with many aircraft of mixed capabilities. The Brisbane airport environment is comparable to US airports such as Dallas Love, Houston Hobby, Portland, St. Louis, Milwaukee, Oakland and literally hundreds of other commercial U.S. airports. This raises the obvious question: What is stopping us from implementing the same efficiency improvements at U.S airports that the Australians are demonstrating at Brisbane? We must act now to provide the public with the near-term economic and environmental benefits available while continuing to push forward on a full implementation of NextGen.

U.S. House of Representatives
Committee on Transportation and Infrastructure

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July 31, 2009

Mr. Chet Fuller
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Dear Mr. Fuller:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry Costello

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
MR. CHET FULLER
PRESIDENT
GE AVIATION SYSTEMS, CIVIL

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV) /
REQUIRED NAVIGATION PERFORMANCE (RNP)"

Questions for the Record To:
Mr. Chet Fuller
President
GE Aviations Systems, Civil

Responses for the Record August 14, 2009

1. ***I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?***

GE applauds Congress for their commitment to NextGen and creating a safe, efficient air transport system capable of handling the forecasted air-traffic demand. We have several suggestions for how to ensure we make the most of this opportunity. First, it is vitally important to invest not only in the individual areas of communication (DATACOMM), navigation (RNAV/RNP) and surveillance (ADS-B), but also in the integration of these historically separate areas. The true power of NextGen to deliver on its goals relies on the incorporation of these CNS capabilities into as a single system interconnected throughout the air and ground by a System Wide Information Management (SWIM) network. Second, to promote the establishment of an efficient ATM system, more defined measurements and metrics need to be developed and implemented.

A holistic systems engineering approach must be adopted, and this integration begins with NextGen management. The authority granted to FAA regarding investment, oversight and management of all areas of NextGen should be consolidated to ensure that individual capabilities and programs supporting NextGen do not compete with one another for funding and support. Unbalanced funding or support creates the unintended risk of focusing too much on a single area at the detriment of the system as a whole. For example, although ADS-B is a critical technology that is an essential foundation to NextGen, excessive focus on it, or any other individual technology, as *the* NextGen solution risks neglecting other, more beneficial aspects of NextGen and detracts from the creation of a functional, integrated system.

Another recommendation to both expedite NextGen and improve its implementation is to create improved metrics to measure the efficiency of ATM services. The FAA's performance and progress toward NextGen should be measured by just that – the effectiveness and efficiency of the "service provided" to the operators and, ultimately, the flying public.

A clear example of this is in the development of RNP procedures, where the current focus is on the quantity of procedures developed rather than the quality and value created for the users of the procedures. While we agree that RNP procedure development should be expedited, metrics should also be developed to ensure that any new or improved RNAV / RNP procedures bring some advantage in the form of improved airspace access, increased fuel-efficiency for operators, reduced emissions, reduced noise, and / or reduced controller workload.

Another example demonstrating the need for improved metrics relates to separation of aircraft. In present operations controllers work to avoid violating "separation minima" rather than working to achieve "separation goals". This lack of incentive leads to the creation of unnecessarily large buffers to separation minima to avoid a violation, thereby reducing capacity and efficiency of the flight profile. A performance measurement goal to reduce the size of the buffers between aircraft to more closely space them within safety limits would improve capacity and increase efficiency. Other performance metrics, such as average holding time and unnecessary fuel burn, would also promote efficiency and should be implemented.

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

NextGen is not receiving the level of funding that would normally be associated with the most critical economic and environmental initiative of an industry contributing 5.6% of GDP[1]. Although it may not be as visible to the general public as crumbling roads and bridges, we are already losing tens of billions of dollars of economic output due to delays and inefficiencies in the air traffic system. Without action, these losses will rise significantly as we fail to meet the forecasted traffic demand.

Updating our air transportation infrastructure before it is too late will require increased and intelligently targeted investment. Intelligent investments are those that:

i. improve safety
ii. increase efficiency of the operations
iii. increase the capacity of the air traffic system
iv. offer holistic system solutions and
v. can be implemented in the near to mid-term

It is important that funding is not targeted at one particular technology, but focuses on the integrated system both in the air and on the ground, as well as the policy and operational changes that will be required to take full advantage of the technology.

An intelligent investment for which the FAA should be applauded is their commitment to various public-private partnerships resulting in significant demonstrations and trials of NextGen concepts. For example, GE is collaborating with FAA on demonstrating 4 Dimensional Trajectory Based Operations (4D TBO), which focuses on the integration of Navigation and Communication and deploys elements of 4D RNP with precise time-guidance capability in revenue flights at one or more busy terminal areas in the U.S.

[1] The Economic Impact of Civil Aviation on the Economy, FAA, October 2008

A clear example of this is in the development of RNP procedures, where the current focus is on the quantity of procedures developed rather than the quality and value created for the users of the procedures. While we agree that RNP procedure development should be expedited, metrics should also be developed to ensure that any new or improved RNAV / RNP procedures bring some advantage in the form of improved airspace access, increased fuel-efficiency for operators, reduced emissions, reduced noise, and / or reduced controller workload.

Another example demonstrating the need for improved metrics relates to separation of aircraft. In present operations controllers work to avoid violating "separation minima" rather than working to achieve "separation goals". This lack of incentive leads to the creation of unnecessarily large buffers to separation minima to avoid a violation, thereby reducing capacity and efficiency of the flight profile. A performance measurement goal to reduce the size of the buffers between aircraft to more closely space them within safety limits would improve capacity and increase efficiency. Other performance metrics, such as average holding time and unnecessary fuel burn, would also promote efficiency and should be implemented.

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

NextGen is not receiving the level of funding that would normally be associated with the most critical economic and environmental initiative of an industry contributing 5.6% of GDP[1]. Although it may not be as visible to the general public as crumbling roads and bridges, we are already losing tens of billions of dollars of economic output due to delays and inefficiencies in the air traffic system. Without action, these losses will rise significantly as we fail to meet the forecasted traffic demand.

Updating our air transportation infrastructure before it is too late will require increased and intelligently targeted investment. Intelligent investments are those that:

i. improve safety
ii. increase efficiency of the operations
iii. increase the capacity of the air traffic system
iv. offer holistic system solutions and
v. can be implemented in the near to mid-term

It is important that funding is not targeted at one particular technology, but focuses on the integrated system both in the air and on the ground, as well as the policy and operational changes that will be required to take full advantage of the technology.

An intelligent investment for which the FAA should be applauded is their commitment to various public-private partnerships resulting in significant demonstrations and trials of NextGen concepts. For example, GE is collaborating with FAA on demonstrating 4 Dimensional Trajectory Based Operations (4D TBO), which focuses on the integration of Navigation and Communication and deploys elements of 4D RNP with precise time-guidance capability in revenue flights at one or more busy terminal areas in the U.S.

[1] The Economic Impact of Civil Aviation on the Economy, FAA, October 2008

Time is the critical element of TBO which can simultaneously increase capacity and improve flight efficiency, and this project will examine how existing equipment may be used to achieve these gains by incorporation of time into the air traffic system.

This project builds upon GE's experience in Scandinavia and in conjunction with FAA, local control authorities and airlines will show what is possible in an air-ground TBO application. This public-private project team will develop a working roadmap and begin moving down this road toward 4D TBO in the National Airspace by the NextGen midterm (2018). This project aims to improve safety, capacity and efficiency in the near- to mid-term time-frame by integrating all aspects of the air traffic system, both in the air and on the ground. This project and others like it need to continue to receive adequate funding and attention, i.e. intelligent investments.

By bringing many relevant stakeholders together to work towards a common goal, these types of benefits-driven FAA-Industry partnerships are critical to accelerate the transition to NextGen. The economic, security, and environmental benefits of NextGen to the aviation industry and the U.S. as a whole are enormous. However, increased, intelligent investment is needed to achieve these benefits and modernize our air transport system.

Testimony of Captain Jeff Martin

Senior Director, Flight Operations, for Southwest Airlines Co.

Before the Subcommittee on Aviation

Transportation & Infrastructure Committee

U.S. House of Representatives

July 29, 2009

Chairman Costello, Ranking Member Petri, Members of the Committee:

On behalf of Southwest Airlines, thank you for this opportunity to share Southwest's experiences thus far with Required Navigation Performance (RNP). My name is Jeff Martin. I am Senior Director of Flight Operations and a pilot for Southwest Airlines. Since 2006, I have been directing Southwest's multi-phased program and business plan to equip our entire fleet of aircraft – over 500 Boeing 737s – and train our nearly 6,000 pilots in RNP and associated NextGen efforts. I have also led Southwest's efforts in working with the FAA to certify the many aspects of our RNP program and to design and implement new flight procedures that will be critical in achieving the safety, operational and environmental objectives that the Next Generation Air Traffic Management System (NextGen) promises to offer.

Southwest Airlines considers RNP to be a major cornerstone of NextGen. RNP combines the accuracy of a satellite-based, Global Positioning System (GPS) with the performance capabilities of today's modern jet aircraft to fly more direct and precise routes and procedures. It's like having a GPS system in your car, enabling the driver to use satellite technology.

If implemented correctly and widely throughout the national aviation system, RNP will 1) strengthen our environment by greatly reducing the amount of fuel we consume and greenhouse gases we emit; 2) provide our Customers with less congestion and fewer delays; and, 3) improve safety and the operational performance of the commercial aviation industry.

Southwest's RNP Program – Jumping into NextGen With Both Feet

Southwest's decision to move forward with RNP was largely based on the experiences of other commercial air carriers that spearheaded the use of this technology several years ago. These carriers have realized numerous benefits including fuel savings and reduction of operational separation variances.

In March of 2007, Southwest decided to make an unprecedented commitment towards advancing NextGen, announcing that we would devote considerable corporate resources – $175 million – to make RNP an integral part of our day-to-day operations. Today, 66% of our fleet – nearly 300 Boeing 737-700 aircraft – is RNP capable. Over the next four years, we plan to retrofit the remainder – 215 Boeing 737-300 aircraft – with GPS receivers, software upgrades and the necessary avionics to fly more direct and efficient RNP procedures.

Earlier this month, Southwest reached an important milestone in our quest to fly more efficiently - more "green" – by successfully implementing autothrottles and vertical navigation (VNAV) modifications to our fleet of aircraft. Autothrottles and VNAV modifications permit our pilots to fly more precise speeds and utilize optimum descent profiles.[1] This step, alone, enables Southwest Airlines to conserve millions of gallons of jet fuel per year, while significantly reducing our emissions. Recently, Southwest successfully demonstrated the environmental benefits of RNP with flights between Dallas Love and Houston Hobby Airports.

In addition to the technological and operational specifications, Southwest is embarking on a four-phase training and education program for all of our pilots. Our nearly 6,000 pilots are currently training on the use of autothrottles, automation and VNAV. The third (next) phase will teach pilots how to perform basic GPS approaches. The final phase will focus on RNP flight procedures. We plan to complete all of this training and begin flying RNP procedures by October 2010.

[1] By 2013, Southwest hopes to have the most advanced fleet of aircraft in the commercial airline industry, each plane equipped with GPS navigation and onboard monitoring displays. This equipment will allow Southwest to more easily prepare for the FAA's eventual transition from a radar-based to a satellite-based air traffic control system.

SWA is working closely with the FAA to assist in the design and publication of new RNP flight procedures for many of the airports we serve. Our goal is to have at least one useful – or "carbon negative" – RNP arrival procedure at each of the 66 airports at which we operate. We fully support the efforts of the FAA's Performance-based Operations Aviation Rulemaking Committee (PARC) to focus on the FAA's 35 Operational Evolution Partnership (OEP) airports, as well as other airports where more efficient procedures can be implemented relatively easily. It is important to note that, despite our investments in RNP, we want any and all RNP procedures to be procedures that can be utilized by any aircraft operator equipped and certified to fly advanced RNP operations.

RNP Benefits the Environment, Customers and Carriers

Environment

RNP reduces an airline's carbon footprint. Flying a more direct, economical path results in track-mile savings. Continuous descent approaches, instead of using current "step down" approaches, are also more efficient. This burns less fuel, thereby reducing aircraft emissions.

Based on Southwest's own demonstration flights, RNP can reduce fuel burn and carbon dioxide emissions by as much as 6 percent per flight. For a company like Southwest Airlines, even a two percent reduction in fuel consumption on 80 percent of our flights would translate into 23 million gallons of fuel saved and carbon reduction of 496 million pounds of CO2.

Customers

RNP takes safety to the next level. It utilizes the airspace more efficiently, which results in decreased congestion and delay. It makes operations more dependable. This means increased on-time performance and a better experience for the flying public.

Carriers

Carriers benefit from RNP in much the same way as Customers. Modifications that make operations more efficient also enhance safety by giving pilots and controllers better situational awareness and the ability to avoid potential dangers. RNP approaches provide increased operational reliability due to decreased dependence on ground-based navigation systems, which

results in more certainty in dispatch operations, increased on-time performance and a higher level of safety.

RNP Going Forward

Unlike some other components of NextGen, RNP capability exists today and has been successfully demonstrated both here and abroad. RNP has been used in recent years by air carriers in Alaska and in many countries throughout the world to achieve safer, more fuel efficient and environmentally friendly flight operations. RNP-capable aircraft are now flying advanced flight procedures in Canada, Australia, New Zealand, and in many parts of Europe, Asia and Latin America.

However, considering that RNP was first developed and demonstrated in the United States over a decade ago, the U.S. has fallen behind many of these other countries in the widespread implementation of RNP. Countries like Canada and Australia have been much more aggressive in accelerating the deployment of efficient RNP flight procedures and incentivizing their carriers to become equipped to fly these procedures.

For Southwest Airlines, we believe now is the time for United States to reclaim its traditional status as the pacesetter in the development, deployment and use of advanced aviation technologies. RNP is a great place to start.

Industry and Government are Working Together

Airlines are showing leadership in equipping our aircraft. Government can show leadership by accelerating NextGen. It is clear that both the FAA and the aviation industry need to jointly train, market and implement a program to assure the future success of RNP.

FAA Administrator Randy Babbitt recently gave a speech before the RTCA in which he said, "We must take advantage of what operators already have invested. RNP and RNAV work. We know that.... With the airlines – and the economy – still looking at a steep climb, the ROI [return on investment] is even more important."

For NextGen to succeed, the FAA can begin by designing an aviation system that guarantees airlines a proper return on their investment through more efficient routes and procedures.

Administrator Babbitt understands that, even in the best economic conditions, an airline will only choose to equip its planes with RNP-enabling equipment if the cost-savings achieved through RNP exceeds the equipage and training costs necessary for RNP implementation.

Southwest Airlines has reached a pivotal point in our quest for RNP. Our Company believes we've taken this as far as we can. It is not responsible for the Company to invest more in further developing our RNP program, until there is more certainty that the other stakeholders in this enterprise are meeting their commitments in a timely manner.

The next steps are up to the FAA. These steps include:

1. Requiring that useful RNP procedures be designed, starting with our nation's busiest airports (i.e., the 35 FAA-designated Operational Evolution Plan (OEP) airports).
2. Establishing a standard to determine whether an RNP procedure is "useful."
    - "Useful" RNP procedures decrease flight miles, which reduce an aircraft's fuel burn;
    - "Useful" RNP procedures are carbon negative;

    One of the examples of a "useful" RNP procedure that has been designed and implemented by the FAA is an RNP approach into Runway 13-Center at Chicago's Midway Airport. This new approach allows aircraft to fly more direct routes and provides procedural separation of aircraft departing from O'Hare Airport
3. To fully leverage the benefits of RNP, aircraft separation standards must be established and revised, as appropriate;
4. Addressing the environmental impact of RNP in a timely and cost-effective manner;
5. Merging NextGen and traditional flights.

The widespread use of Continuous Descent Approaches (CDA) or Optimized Profile Descents (OPD), combined with revised separation standards, are necessary to enhance airspace and runway capacity as well as the aircraft's operational performance. All of this can be done without compromising safety.

RNP's Success Will Propel Other NextGen Initiatives

Administrator Babbitt recently acknowledged the need to accelerate NextGen implementation. According to the Administrator, "NextGen is just flat out not moving fast enough." We agree. NextGen needs to be accelerated.

Because RNP technology exists today and because it is proven to create greater environmental and operational efficiencies – including sizable reductions in fuel consumption and carbon dioxide emissions – RNP really is "low hanging fruit" for the FAA and industry, in the context of NextGen. RNP also can help pave the way for the future deployment of ADS-B and the FAA's future satellite-based air traffic control system.

My colleagues at Alaska Airlines have long benefited from safe, reliable and efficient RNP procedures in Alaska. Other U.S. airlines are currently certified for RNP and RNAV procedures, but are awaiting the deployment of new and efficient RNP flight procedures to reinforce their past and future investments.

Lessons Learned

During the past 36 six months, the Flight Operations Department at Southwest Airlines has been fully engaged and committed to our NextGen project. Our RNP program is, without a doubt, the most complicated and time-consuming project that Southwest has ever embarked upon. Southwest Airlines has learned that it's difficult, complicated, and expensive to implement RNP.

Our final Operational Specification – or OPSPEC – package, which is a regulatory requirement for future RNP operations, consisted of 1,871 pages, including regulatory support materials and training procedures. Our training procedures team worked nonstop for 19 months to design our pilot training curriculum. As we found out, adequate time and sufficient resources are necessary to design useful procedures, certify air carriers and provide necessary training.

One of the most important lessons we have learned at Southwest is the importance of employee education, marketing, and technical training. At Southwest, we like to think we're aware of "People" factors. However, we've discovered that the human factors involved in NextGen are often overlooked.

On behalf of Southwest Airlines, thank you for this opportunity to testify and to share our thoughts and experiences with RNP. We look forward to working with the FAA, elected officials and industry stakeholders in ensuring RNP's future success.

Testimony of Captain Jeff Martin

Senior Director, Flight Operations, for Southwest Airlines Co.

Before the Subcommittee on Aviation

Transportation & Infrastructure Committee

U.S. House of Representatives

July 29, 2009

Chairman Costello, Ranking Member Petri, Members of the Committee:

On behalf of Southwest Airlines, thank you for this opportunity to share Southwest's experiences thus far with Required Navigation Performance (RNP). My name is Jeff Martin. I am the Senior Director of Flight Operations and a Captain for Southwest Airlines. Since 2006, I have been directing Southwest's multi-phased Nextgen program and business plan to equip our entire fleet of aircraft – over 500 Boeing 737s – and in addition train our nearly 6,000 pilots in RNP and associated NextGen efforts.

LIKE SOUTHWEST OUR RNP PROJECT IS UNIQUE

In March of 2007, Southwest decided to make an unprecedented commitment towards advancing NextGen, announcing that we would devote considerable corporate resources – $175 million – to make RNP an integral part of our day-to-day operations. Southwest based our business plan, and set the standard for our Return on Investment (ROI), by determining that we need to reduce our flight track by 3 miles (1 minute per leg). Reducing flight track miles burns less fuel. Fuel is an airlines' highest cost behind labor so there is a natural incentive for airlines to reduce fuel burn, which translates into reduced aircraft emissions and lower fuel costs.

By using available technologies like RNP, the implementation of NextGen can be accelerated. NextGen enables airlines to meet the challenges of Climate Change. In addition to reaping environmental benefits, RNP benefits Consumers by reducing congestion and delay as well as benefiting carriers because of the operational efficiencies that are created. These factors make the business case for using RNP technology.

Southwest's NextGen RNP project can be broken down into 4 distinct work areas:

1. **Aircraft equipage and modification** – Of our 500 aircraft, each required some equipment modification. Today, 66% of our fleet is RNP capable and we will complete our remaining modifications in 4 years. Equipage consumed 80% of our Nextgen budget, and proved to be expensive, time consuming and complicated.

2. **FAA regulatory approval (OPSPEC is like a drivers' license)** OPSPEC is a regulatory requirement for future RNP operations. Our final Operational Specification (OPSPEC) package took 24 months to put together and consisted of 1,871 pages, including regulatory support materials and training procedures.

3. **Pilot training and marketing efforts** – Southwest planned four separate training seminars. Developing the curriculum for these seminars took 19 months of time-consuming planning and research to design. Pilot training will consume 13% of our budget.

4. **Airport procedures** - SWA is working closely with the FAA to assist in the design and publication of new RNP flight procedures for many of the airports we serve. Our goal is to have at least one "useful" RNP arrival procedure at each of the airports we serve.

A recent audit of our airport procedures revealed that 412 runway ends or approaches exist on the 68 airports we serve. Of these, 69 current RNP procedures exist. Of the 69 procedures less than six are "useful". Like the standard for Southwest's ROI, "useful" procedures reduce flight track miles and are carbon negative.

From start to finish, Southwest's RNP program will have taken 6 years. In addition to time and money, it has required focused project oversight and considerable attention to human factors, such as marketing and training.

RNP Benefits the Environment, Customers and Carriers

If implemented correctly and widely throughout the national aviation system, RNP will 1) strengthen our environment by greatly reducing the amount of fuel we consume and greenhouse gases we emit; 2) provide our Customers with less congestion and fewer delays; and, 3) improve safety and the operational performance of the commercial aviation industry.

Based on Southwest's own demonstration flights, RNP can reduce fuel burn and carbon dioxide emissions by as much as 6 percent per flight. Translating this savings across our network we could burn 90.6 million less gallons of fuel and reduce our CO2 emissions by 1.9 billion pounds annually.

Nextgen success is dependent on Industry and Government Working Together

SWA has worked closely with the FAA from the beginning of this project. We conduct quarterly project updates with the FAA administrator to share joint project timelines. Coordination and communication are keys to success.

FAA Administrator Randy Babbitt recently gave a speech before the RTCA in which he said, "We must take advantage of what operators already have invested. RNP and RNAV work. We know that..... With the airlines – and the economy – still looking at a steep climb, the ROI [return on investment] is even more important."

Southwest Airlines could not agree more – achieving a return on investment is necessary to justify continued NextGen efforts.

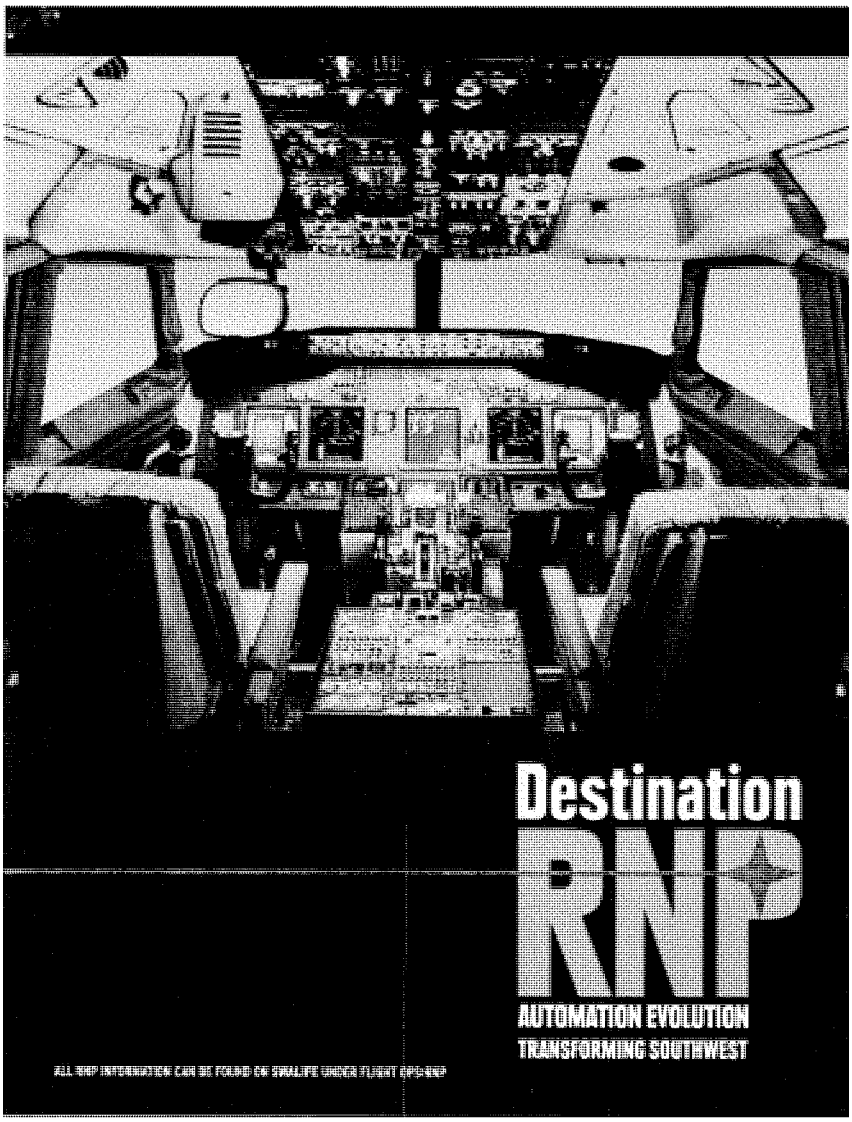
Lessons Learned

During the past 36 six months, our airline has been fully engaged and committed to our NextGen project. From our CEO down to every department, we have made Nextgen a priority for our corporation. Our RNP program is, without a doubt, one of the most complicated and time consuming projects that Southwest has ever embarked upon. Southwest Airlines has learned that it's difficult, complicated, time consuming and expensive to implement RNP. Our Southwest Team has excelled and we are proud of our Nextgen efforts. We have equipped over 300 aircraft and will soon complete Pilot training.

In order for the industry and the public to achieve the full benefits of RNP, it is incumbent on the FAA to design and implement flight procedures like those at MDW. For Nextgen to succeed, FAA, airlines, and other stakeholder must all be in sync and working from the same playbook. Existing regulations and guidelines from the 60's and 70's need to be updated in order to utilize and benefit from Nextgen capabilities and technology.

Successful use of RNP/NextGen requires 1) a definite benefit with a definable return on investment; 2) an emphasis on the **quality** of the procedure; not just meeting a quota for production; and 3) a **mandate** to design and implement new flight procedures that will reduce airline emissions and fuel burn.

Southwest Airlines is proud to be leading the industry in deploying our 500 aircraft into NextGen airspace. We are grateful to Alaska Airlines and others that have gone before us in proving RNP. Thank you for this opportunity to testify and to share our thoughts and experiences with RNP. We look forward to working with the FAA, elected officials and industry stakeholders in ensuring RNP's future success. Southwest Airlines remains committed to RNP and Nextgen.


Destination
RNP
AUTOMATION EVOLUTION
TRANSFORMING SOUTHWEST

CAPTAIN CHUCK MAGILL
VICE PRESIDENT FLIGHT OPERATIONS

SOUTHWEST AIRLINES AND RNP – PREPARING TO ENTER THE NEXT GENERATION OF COMMERCIAL AVIATION TECHNOLOGY

We are indeed entering one of the most exciting times in the history of our airline. We are in the final stages of our journey to realize the Next Generation of aviation technology–RNP.

RNP is a cornerstone in the future of the National Airspace System. The FAA's NextGen plan is a wide-ranging transformation of the entire air transportation system to meet future demands. NextGen advances us from ground-based surveillance and navigation to a new and more dynamic satellite-based system. The new capabilities and the advanced technologies that support them will change the way the airspace system operates. RNP and the FAA's NextGen airspace transformation will reduce congestion, shorten route structures, and improve the Passenger experience.

You're about to begin RNP Training Steps 2, 3, and 4, which will get us to our ultimate goal of flying RNP and GPS procedures. You will see an absolutely phenomenal training product, which is like nothing you have ever seen at Southwest before. This "hands on" training will guide you in unlocking the true potential of our aircraft and prepare you to fly the next generation in commercial aviation technology.

As we enter this final push to realize RNP through the next three training steps you need to come prepared and have a working knowledge of procedures learned in Step 1 Training. You will need to be open minded to new learning as we adapt and incorporate new state-of-the-art technology into our operation.

Countless hours have been devoted with an unmatched collaborative effort across nearly every department at Southwest Airlines–all with the goal to make us true industry leaders in NextGen technology and procedures. I want to personally thank and acknowledge the many individuals in Flight Operations who have gotten us to this point. This is a huge undertaking and required much personal sacrifice to get the job done, and I want you to know your efforts have not gone unnoticed. I am proud to be a member of this Team and to be a Pilot at Southwest Airlines during this automation transformation.

This is an exciting time for many of us as we learn new simplified procedures which will reduce our workload, improve our situational awareness, and enhance our Safety. We must embrace this technology to compete and operate in the NextGen airspace. Good luck with your training. We're almost there; thanks for your efforts, for your professionalism, and for your dedication to RNP.

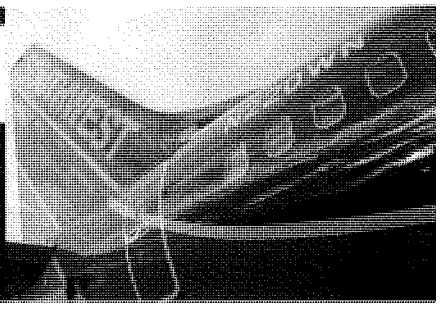
"Southwest Airlines has taken the lead in our industry with our previously-announced commitment to Next Generation navigation techniques known as RNP. With higher energy costs, we need a commitment to the Next Generation of technology to continue to reduce fuel consumption, costs, and emissions,"

remarked Chairman, President, and CEO Gary Kelly at this year's Annual Shareholders Meeting

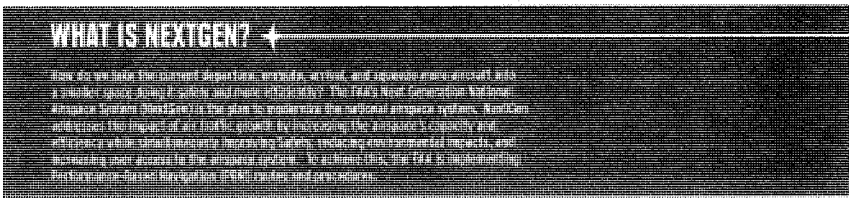
RNP FACTOID: Track Mile Savings

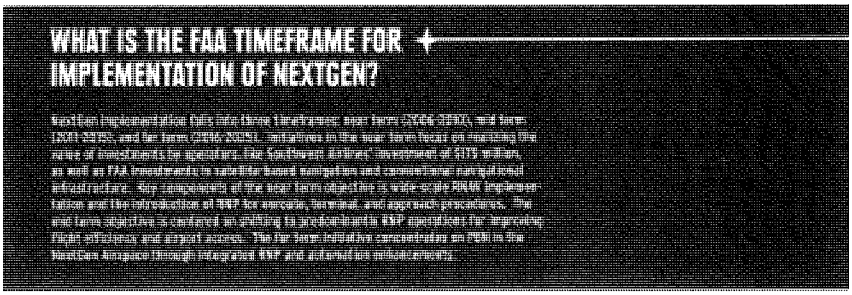
Did you know, for each mile you save, you...

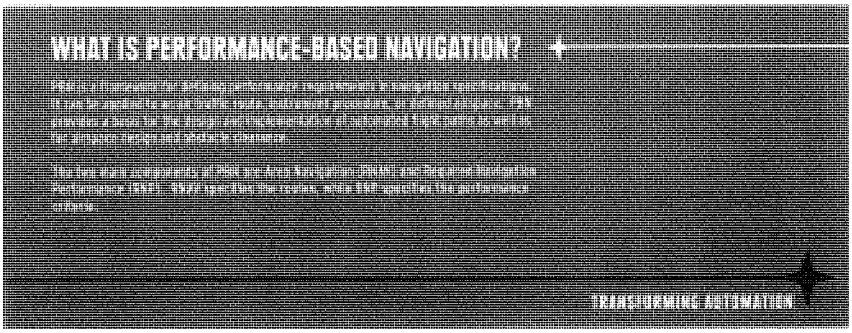
save **12.25 seconds** of flight time.
save **29.3 pounds** of fuel.
eliminate **91.9 pounds** of CO_2.
eliminate **.34 pounds** of NO_x.



NEXTGEN


WHAT IS NEXTGEN?


WHAT IS THE FAA TIMEFRAME FOR IMPLEMENTATION OF NEXTGEN?


WHAT IS PERFORMANCE-BASED NAVIGATION?
TRANSFORMING AUTOMATION

RNAV AND RNP

WHAT IS RNAV?

RNAV enables aircraft to fly on any desired flight path within the coverage of ground- or spaced-based navigation aids, within the limits of the capability of the self-contained systems, or a combination of both capabilities. Simply stated, RNAV aircraft have better access and flexibility for point-to-point operations.

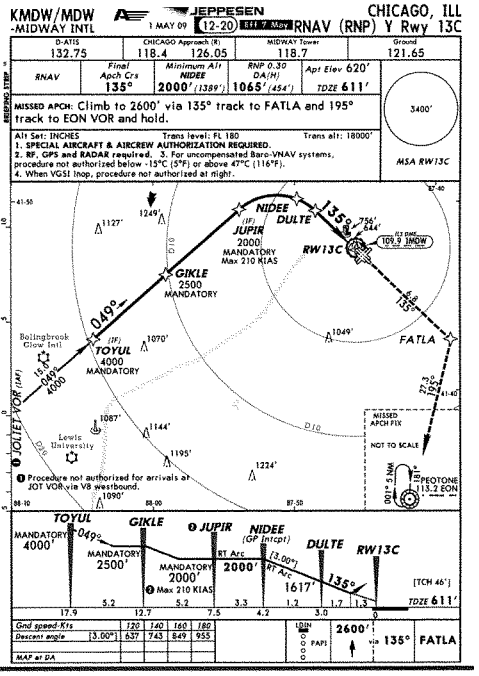
WHAT IS RNP?

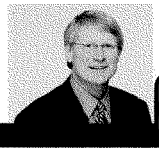
RNP is RNAV with the addition of onboard performance monitoring and alerting. An RNP operation provides the ability of the aircraft navigation system to monitor the navigation performance of the aircraft and, in turn, inform the Crew if the requirement is not being met. The onboard monitoring and alerting capability enhances the Crew's situational awareness and can enable reduced obstacle clearance or closer route spacing without intervention by Air Traffic Control.

HOW IS RNP DIFFERENT FROM RNAV?

Although RNP and RNAV both involve preprogrammed FMS procedures, they have many key differences:

- Enhanced RNP requires GPS; RNAV can be conducted with or without GPS.
- Aircraft performing RNP operations continuously monitor aircraft navigation capabilities (navigation performance). If navigation performance falls below minimum specified values, Pilots are alerted (*e.g.*, UNABLE READ NAV PERF-RNP).
- RNP offers curved paths called Radius to Fix (RF) legs. Traditional RNAV course changes utilize Track to Fix (TF), which stitch together straight-lines. For example, if a course change is required on a traditional RNAV procedure, the procedure simply connects the two segments associated with that course change. The radius of turn depends upon the degree of course change and ground speed of the aircraft. The result is a varied ground track based on groundspeed. On the contrary, an RNP procedure can use an RF leg for course change, which defines a radius to be flown regardless of groundspeed. The end result is a consistent ground track that is independent of aircraft type.
- The combination of GPS monitoring and alerting allows RNP users to navigate around obstacles, other traffic, and/or environmentally-sensitive areas where current ground-based navaid procedures cannot.
- The actual path flown by RNP aircraft follows a predetermined path with an accuracy measured in feet. Ground tracks on RNAV aircraft can vary significantly, and the Crew is typically unaware of any navigation error. The precision accuracy of RNP provides an added level of Safety, which is unmatched by traditional navigation capabilities.





MIKE VAN DE VEN
CHIEF OPERATING OFFICER

It is stated in the Introduction of the Southwest Airlines ***Flight Operations Manual*** that "The most important Flight Operations/Flight Dispatch decision-making priority is safety. No priority at Southwest Airlines takes precedence over the well being of our People, Customers, and equipment." Our next priority is service, and following service is efficiency. Each time we consider a change at Southwest, we ask ourselves if the change is consistent with these three priorities. In the end, whatever the driving force for a change might be, we always consider Safety first.

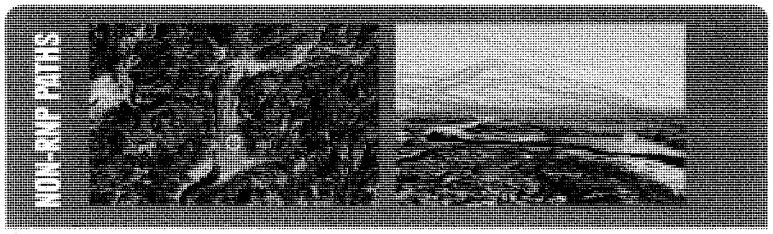
Strict adherence to these operational priorities has been the foundation of our success. We have one of the best Safety records in the industry; we're consistently praised for our superior service; and our efficiency provides the necessary cost advantage to help us compete in a savage market plagued by variables beyond our control. In order to continue down our path of success and remain a strong Company, we must continually strive to improve.

It's not often that a new technology or procedure can offer large-scale, positive contributions to each of our operational priorities. But, this is precisely the case with Required Navigation Performance (RNP). RNP takes Safety to the next level and also offers increased dependability (service) and efficiency—a virtual home run. Considering the current state of our industry, improving all of our operational foundations is more important now than ever before.

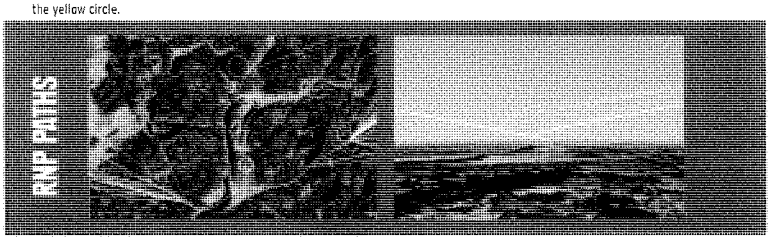
We have accepted the FAA's "call to action" to implement Performance-Based Navigation. In support of the joint government/industry strategy referenced in the FAA's Roadmap for Performance-Based Navigation, we've made a significant financial commitment.

Bringing together the accuracy of Global Positioning System (GPS); the capabilities of advanced aircraft avionics; and new flight procedures, RNP will achieve safer, more efficient, and environmentally-friendly flight operations. Transitioning to RNP will be a monumental initiative for our Company. We've made a Corporate commitment to support RNP and require your commitment in order to achieve success.

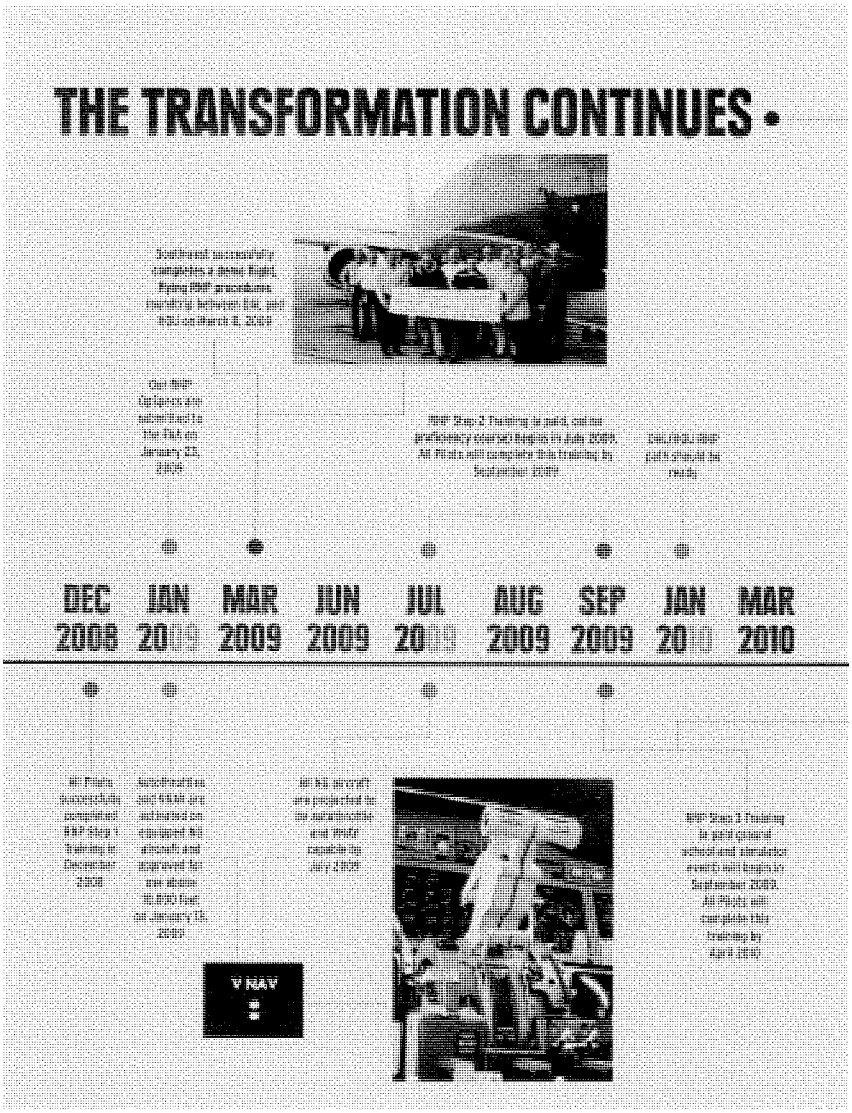
RNP is the cornerstone of the FAA's Next Generation (NexGen) Airspace. We could ignore what's to come and simply wait until tomorrow is upon us. Instead, we are committed to being industry Leaders and capitalizing on the benefits of this technology. We will truly be Leaders in this initiative and the eyes of the world are upon us. Thank you in advance for your hard work and commitment to success.



The graphics above show actual non-RNP flight paths from an overhead view (left) and vertical profile (right). The airport is represented by the yellow circle.



The graphics above show actual RNP flight paths from an overhead view (left) and vertical profile (right). The airport is represented by the yellow circle. The inbound paths from the east result in a 31 NM reduction in miles flown. Paths from the west result in a 41 NM reduction. Notice the consistent and precise tracks in both perspectives.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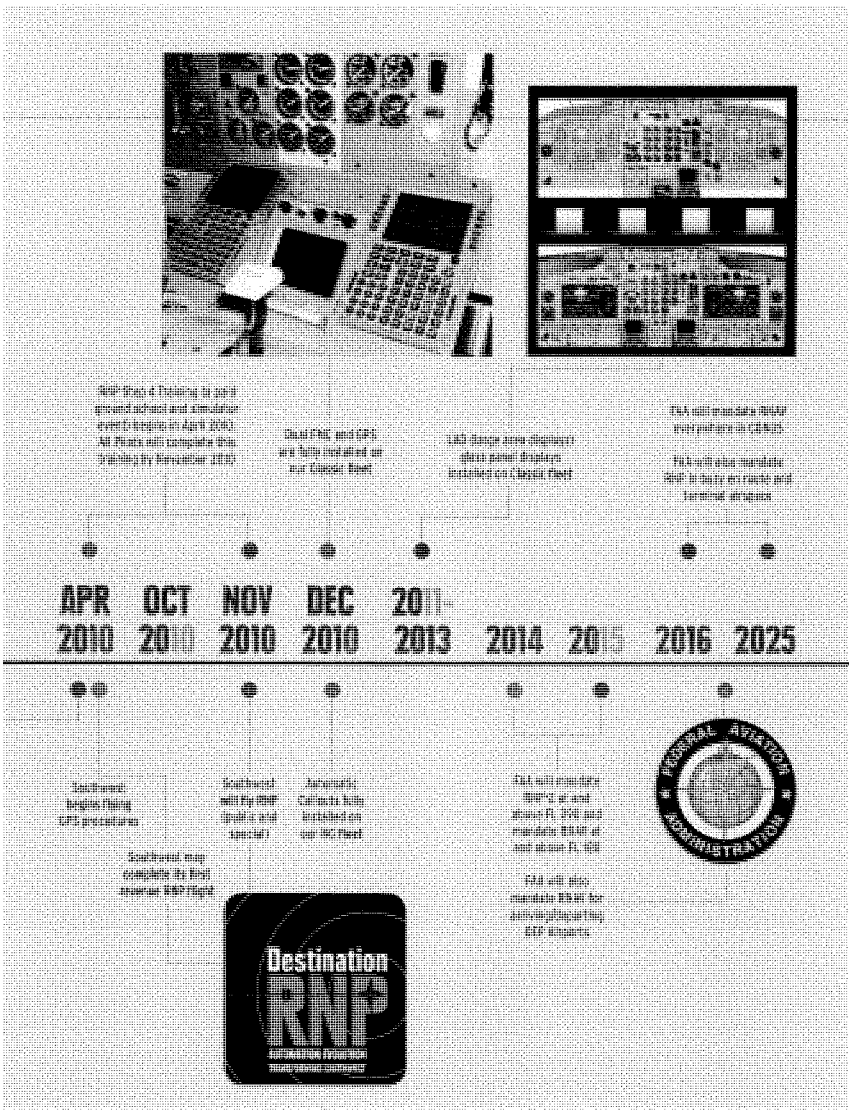
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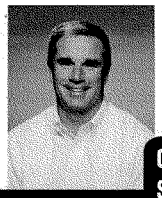


CAPTAIN JEFF MARTIN
SENIOR DIRECTOR FLIGHT OPERATIONS

This initiative reaches far beyond simply adding a new type of Instrument Approach Procedure. In fact, RNP operations can be conducted over an entire flight segment. Viewing this initiative in even a broader sense, it is a complete redesign of our operational philosophy, particularly as it applies to automation.

The precision accuracy of RNP provides an added level of Safety, which is unmatched by traditional navigation capabilities—enough reason in and of itself to embrace this new technology. RNP also produces savings, which reach across the entire spectrum of flight. In addition to track mile savings, RNP allows the design of engine-out procedures that couldn't previously have been flown by our aircraft, subsequently providing an opportunity for increased maximum allowable takeoff weight. On departure, the same precision capabilities result in a reduction in the amount of required airspace, thereby allowing flight paths where they previously were restricted due to traffic separation, terrain, restricted airspace, and noise abatement. This leads to reduction in track miles, requiring less fuel, and resulting in reduced takeoff weights.

This same philosophy continues throughout arrival and approach. Additionally, on descent and arrival, strategically-designed constant descent profiles provide fuel savings over traditional step down descents. RNP approaches provide increased operational reliability due to decreased dependence on ground-based navigation systems—increased dispatch ability, ontime performance, and, most importantly, a higher level of Safety.

Combined with autothrottles, this initiative is not just a monumental shift in our operational philosophy—it is a monumental step in increasing overall Safety and reducing our operational costs.

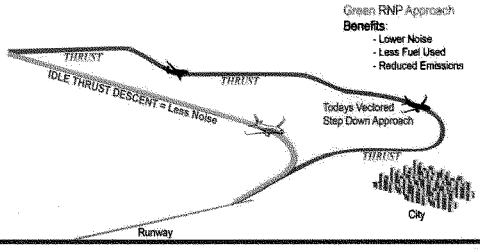
We'll be deploying this effort in phases over the next six years. The first phase, which introduced our new automation policy, began in late 2008. Among other things, this will redefine procedures for manual flight, automatic flight, navigation displays, FMC programming/verifying, MCP, and autothrottle use.

Aircraft modifications, which are also being accomplished in phases, have already begun. We first activated autothrottles and VNAV, including FMC updates on the -700s. The next step, called Phase One modifications, began in the later part of 2008. This modification is adding a second FMC and CDU, and dual GPS to the Classic fleet. VNAV will also be activated at this time. Phase Two modifications are projected to begin in 2010/2011. This modification replaces the current complement of analog flight instruments on Classic aircraft with Glass Panel Displays. This enables a moving map display, an RNP requirement, providing increased situational awareness resulting in a higher level of Safety.

The next step in reaching our final objective will be implementing the use of VNAV on instrument approaches. On this deployment, VNAV use for approach will be limited to RNAV/GPS approaches. Pilots will receive simulator training, which will begin in September 2009. The final step is RNP operations. RNP training will be an additional simulator event planned for 2010. The goal is to be flying RNP systemwide by 2013.

Southwest Airlines is committed to RNP, and Flight Operations is committed to doing it right. We're the first U.S. carrier to commit to 100 percent RNP operations. The FAA is committed to RNP for NexGen Airspace. In cooperation with the FAA, we'll set the industry standard. A lot of work has already been accomplished, but we have a long way to go.

In the upcoming months, we'll provide each of you with a wealth of information covering the entire spectrum of this initiative. Captain Bob Torti and his Training Team will provide you with the highest quality training to ensure knowledge and proficiency. In the end, it is Flight Operations' goal that every Southwest Airlines Pilot be the industry expert in automation and RNP, and we're committed to giving you everything you need to achieve that status.



U.S. House of Representatives
Committee on Transportation and Infrastructure

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

Washington, DC 20515

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

July 31, 2009

Captain Jeff Martin
Senior Director, Flight Operations
Southwest Airlines
P.O. Box 36611
2702 Love Field Drive, HDQ 8FO
Dallas, Texas 75235-1611

Dear Captain Martin:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
CAPTAIN JEFF MARTIN
SENIOR DIRECTOR, FLIGHT OPERATIONS
SOUTHWEST AIRLINES

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

SOUTHWEST AIRLINES

Captain Jeff Martin
Sr. Director, Flight Operations
Flight Operations
P.O. Box 36611, HDQ8FO
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214-792-6398
Facsimile: 214-792-4646
Email: jeff.martin@wnco.com

August 11, 2009

Chairman Costello
Subcommittee Aviation

Washington, DC 20515

WHAT ACTIONS CAN CONGRESS DO TO EXPEDITE OR IMPROVE NEXTGEN?

A. Industry has identified numerous hurdles to NextGen implementation:

1. To date, the FAA has not designed nor implemented many direct and efficient flight procedures. Most new RNP/RNAV procedures are simply overlays of existing procedures which do not provide a benefit to the National Airspace System or its users.
2. Without useful procedures in place, there is no return on investment for industry. This acts as a disincentive for industry to invest in either existing or future NextGen capabilities.
3. FAA employees do not appear to have bought in to NextGen, its individual capabilities or the importance of ensuring NextGen's successful implementation/
4. ATC require training if they are to be provided with new tools to manage NextGen procedures.
5. Current environmental review process is too time-consuming and slows the development of environmental-friendly NextGen procedures.
6. Existing environmental procedures focus almost exclusively on the noise impacts of new procedures and fail to adequately factor in the environmental benefits of NextGen, including reductions in emissions, noise and fuel consumption.

B. Congress can help to expedite and improve NextGen by:

1. Placing a metric on the FAA requiring that any new procedures reduce fuel consumption and aircraft emissions. (Current RNP procedures are being designed without a defined goal or objective of reducing fuel burn or emissions).
2. Providing FAA with sufficient staffing and other resources – whether in-house and/or through 3rd parties – to design, test and publish new efficient procedures beginning with the Nation's 35 busiest (OEP) airports. The FAA also needs enough and efficient staff to review multiple RNP license requests (OPSPEC) and ensure their quick approval.
3. Ensuring the FAA's performance based navigation program is organized properly with better direction and a coherent strategy going forward. Southwest's experience leads us to believe the FAA tends to work in silos and that regional offices are often left to interpret procedure design requirements without clear direction from headquarters.
4. Requiring new separation standards that leverage the capabilities of satellite-based navigation, which are essential to improving flight safety and airspace capacity.

5. Ensuring both the FAA and industry are equipped and trained to the same standards. It took Southwest Airlines 19 months to build a training curriculum and another 12 months to train our pilots. These challenges should be recognized and sufficient resources dedicated for both equipage and proper training of key employee groups.
6. Streamlining the environmental review process. Existing environmental procedures are preventing the government from moving forward with initiatives to significantly improve environmental quality – both locally (reductions in noise, ozone, particulates) and globally (fewer greenhouse gas emissions).

ARE WE ADEQUATELY FUNDING ALL ASPECTS OF NEXTGEN?

Industry and the FAA must work together for NextGen to succeed. First, the FAA needs sufficient staffing and resources:

a. To design, test, and publish new efficient flight procedures;
b. To review multiple RNP license requests (OPSPEC) and ensure their quick approval;
c. To develop and implement separation standards; and
d. To educate and train key personnel with regards to the various components of NextGen.

Second, while Congress is allocating funding to equip NextGen at the government level, there are currently no incentives in place at the industry level, nor is there any guaranteed return on investment for industry's costs related to equipage and training. Assistance with equipment and training costs, combined with a guaranteed timeline for the implementation of useful flight procedures and separation standards, are necessary for NextGen to succeed.

STATEMENT OF DR. AGAM N. SINHA
COMMITTEE ON TRANSPORTATION AND
INFRASTRUCTURE, SUBCOMMITTEE ON AVIATION
U.S. HOUSE OF PREPRESENTATIVES
NEXTGEN: AREA NAVIGATION (RNAV) AND REQUIRED NAVIGATION PERFORMANCE (RNP)

JULY 29, 2009

DR. AGAM N. SINHA
SENIOR VICE PRESIDENT AND GENERAL MANAGER
THE MITRE CORPORATION
CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT
7515 COLSHIRE DRIVE, MS N642
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(703) 983-6410

Good morning, Chairman Costello, Ranking member Petri, and Members of the Subcommittee. Thank you for inviting me to participate in today's hearing on NextGen: Area Navigation (RNAV) and Required Navigation Performance (RNP). My name is Agam Sinha and I am a Senior Vice President at The MITRE Corporation. I am also the General Manager of MITRE's Center for Advanced Aviation System Development (CAASD), which is the Federal Aviation Administration's (FAA's) Federally Funded Research and Development Center (FFRDC).

My testimony today will address RNAV and RNP, which together form the FAA's Performance-based Navigation (PBN) initiative and constitute a foundational element of NextGen. I will be addressing the following points:

- Over the past few years, RNAV and RNP procedures have been implemented in some of the most complex airspaces in the nation, to include terminal and en route airspace, which have resulted in significant benefits such as increases in capacity, reduction of delays, and reduction of emissions.

- These implementations have been successful due to the close collaboration between the FAA and the aviation community, through forums such as RTCA and the Performance-based Operations Aviation Rulemaking Committee (PARC), as well as the close coordination between the FAA's air traffic and flight standards organizations.

- Additional benefits can be achieved in the near-term through new applications of RNAV and RNP, and through optimized aircraft vertical profiles, especially during the descent phase of the flight. Recent MITRE modeling and analysis have shown potential significant benefits of these optimized profile descents in terms of reduced fuel consumption and reduced emissions. Another potential near-term benefit can be realized by the use of advanced RNP procedures to decoupling flight paths in complex airspace, resulting in improved traffic flows and airspace efficiencies.

- Aircraft equipage for RNAV and RNP operations has increased over the past few years, which enables nation-wide application of these procedures. A recent MITRE analysis of the Part 121 operators shows that overall RNAV equipage exceeds 90 percent, while RNP equipage varies depending on the RNP level. More advanced RNP capabilities that enable more beneficial procedures are about 40 percent of the fleet.

- While there are beneficial near-term opportunities to leverage RNAV and RNP as outlined above, even greater benefits can be realized beyond the near-term by utilizing RNAV and RNP as part of a more comprehensive airspace re-design, by moving away from overlays of historical traffic patterns and designing more efficient flight paths in the airspace. Recent experience in airspace design has shown longer lead time in implementing non-overlay routes, including significant efforts needed to address the environmental requirements that exist today. Streamlining the environmental process can potentially shorten the implementation timelines, resulting in earlier benefits.

- Finally, as we look ahead, RNAV and RNP in combination with other capabilities such as ADS-B, air/ground data communications, and enhanced ground automation can result even in greater benefits.

Area Navigation (RNAV) and Required Navigation Performance (RNP)

In the past, airspace design and utilization were the result of several limiting factors, including the dependence on the location of ground-based navigation aids (NAVAIDs) and conventional navigation methods, i.e., navigating from one NAVAID to another NAVAID. These conventional navigation methods lead to inefficient routes, procedures and airspace usage.

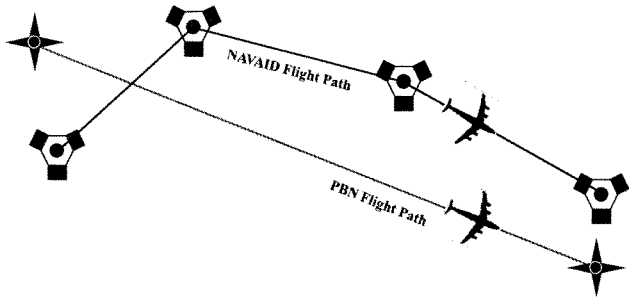


Figure 1: PBN Enables Design of Efficient Routes

The aviation community is moving forward in solving these problems by better utilizing capabilities already available on a vast majority of air transport and regional airline aircraft to perform RNAV and RNP operations, also known as Performance-based Navigation (PBN).

As illustrated in Figure 1, RNAV enables aircraft to fly any desired path rather than flying to or from a fixed ground navigation aid. RNP takes advantage of more advanced on-board avionics that monitor the aircraft's navigation performance and alert pilots when the required performance is not being achieved.

RNAV and RNP Equipage

RNAV and RNP equipage have been steadily increasing over the past several years. MITRE's analysis of the air transport fleet documents high levels of RNAV and growing levels of RNP equipage. Forecasts of new production aircraft indicate acceleration and continued growth in PBN capability. Figure 2 depicts current and future PBN equipage (assumes no retrofit). For air transport aircraft operations in 2009, RNAV equipage exceeds 90 percent. RNP equipage (specifically RNP 0.3 capable aircraft) exceeds 60 percent. Advanced RNP (specifically RNP 0.3 with curved-path capable aircraft) equipage is nearly 40 percent.

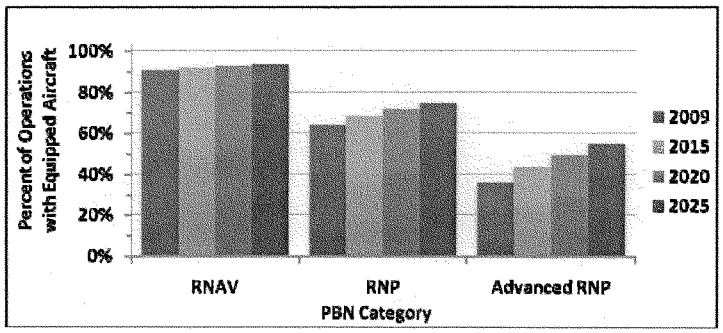


Figure 2: PBN Equipage: Current and Forecast for Air Transport Fleet

RNAV and RNP Procedures

RNAV and RNP procedures are being implemented to achieve repeatable and predictable departure, en route, arrival, and approach paths for aircraft. These procedures improve airport capacity and throughput, reduce the likelihood of aircraft collisions with terrain, improve situational awareness and predictability for pilots and controllers, and achieve more-efficient traffic flows. Using RNAV and RNP also enables the creation of procedures for airports where the limitations due to terrain and other obstacles make it difficult or impossible to safely fly conventional procedures.

RNAV procedures are being used to increase terminal area ingress and egress, as well as increase runway use for departures. For example, Figure 3 illustrates the East and South departure flows from Hartsfield-Jackson Atlanta International Airport; RNAV procedures have enabled additional departure flows in each direction without additional navigational infrastructure costs. In addition, MITRE analyses of the diverging (i.e., fanning out) RNAV departure procedures implemented in Atlanta in 2006 found increased throughput and reduced delays, with a measured capacity gain of 9 to 12 departures per hour. Analysis of these procedures shows $30M in annual benefit (at 2007 demand levels) and a cumulative savings of $105M for the operators who flew these procedures through 2008.

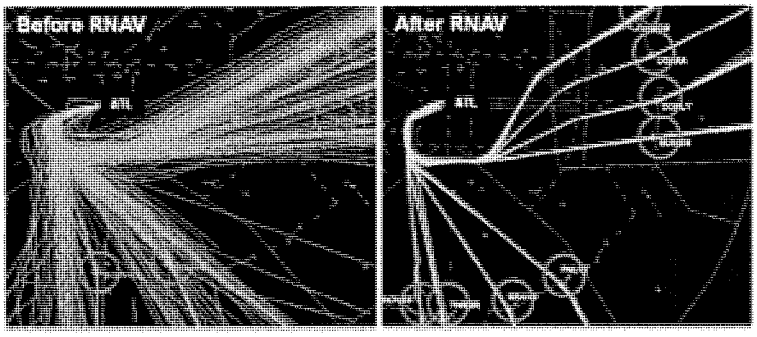


Figure 3: Atlanta Airport West Flow RNAV Departure Procedures

The FAA continues to improve operations in Atlanta with a new runway and with additional implementation of RNAV diverging procedures for flights departing to the East, as those shown in Figure 4. MITRE estimates that implementing these diverging procedures will yield additional benefits to the Atlanta airport operators in the range of $8M to $23M per year.

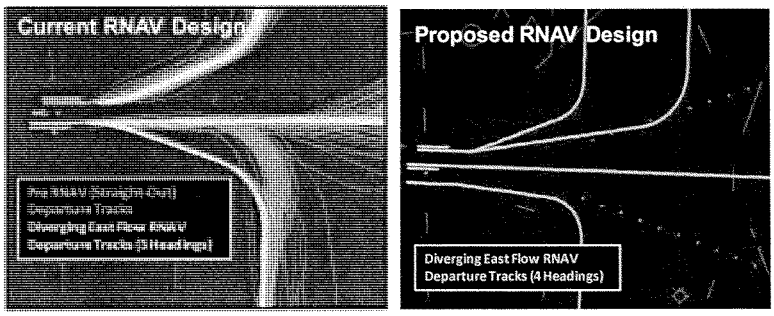


Figure 4: Proposed Diverging East Flow RNAV Departure Procedures at Atlanta

In addition to delay and efficiency benefits, RNAV procedures result in reducing the workload associated with routine voice communications between pilots and air traffic controllers. The reduced level of voice communications decreases the likelihood of "read-

back/hear-back" errors and allows for improved situational awareness. For example, MITRE analysis of the Atlanta RNAV departure procedures shows a decrease of about 50 percent in voice communications and a commensurate decrease in likelihood of communication errors.

Similar RNAV procedures have been implemented at airports such as Dallas-Ft. Worth International Airport (DFW), Las Vegas – McCarran International Airport (LAS) and Phoenix International Airport (PHX), with an annual savings of $45M and a cumulative savings of $130M (2006 through 2008), based on MITRE's post-implementation analyses of these RNAV procedures.

RNP procedures result in a decrease in aircraft path variability and more precise and repeatable flight tracks. RNP systems on the aircraft are designed to monitor the navigation performance of the aircraft. As a result, flight crews have a better understanding of how precisely the aircraft is navigating. The crew is alerted by on-board monitoring systems when the aircraft does not meet the required navigation performance for the procedure. The reduction in variability, increase in path precision and repeatability, coupled with the RNP alerting capability, allow for design of procedures to decouple flight paths in complex airspace leading to more efficient traffic flows and to enable access to runways.

As shown in Figure 5, a MITRE analysis of arrivals at Portland International Airport (PDX) shows a significant reduction in the variability of flight tracks and improved vertical profiles, resulting in both fuel savings and reduced emissions. Additionally, RNP enables the design of precise curved paths through the airspace, adding flexibility to circumnavigate noise-sensitive and obstacle-challenged locations. MITRE researchers have estimated that the RNP procedures at Portland have resulted in fuel savings of 150,000 gallons and a reduction of 7,500 tons of carbon emissions since implementation in 2006.

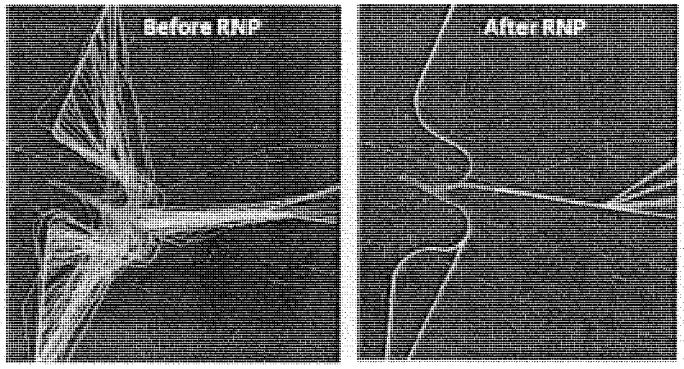


Figure 5: Portland Approach Flight Tracks

In many metropolitan areas, arrival and departure paths at nearby airports can interfere with each other. This means that even in perfect weather conditions, an aircraft at one airport may be delayed on the ground while aircraft at a nearby airport are landing or departing. The greater precision and predictability of aircraft trajectories using RNAV and RNP makes it possible to address this problem by placing more arrival and departure routes in heavily congested airspace than would be possible using traditional navigation procedures. For example, the use of an RNAV departure procedure at Chicago O'Hare International Airport (ORD) in combination with an RNP approach procedure for Chicago Midway Airport (MDW) reduces the amount of interference of the two flows (See Figure 6). A MITRE simulation study of this concept estimates a savings of approximately $4.5M per year in reduced delays under a full PBN equipage scenario.

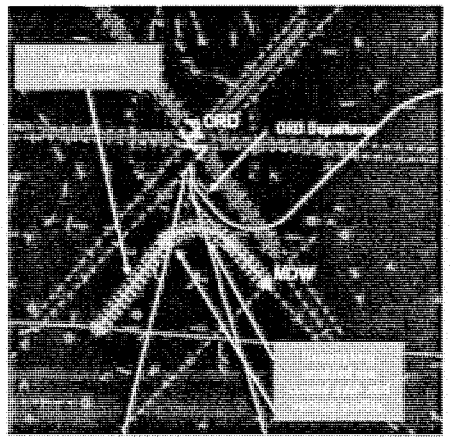


Figure 6: Decoupling of ORD Departures and MDW Arrivals

The FAA and industry have implemented over 300 RNAV arrival and departure procedures, and have implemented more than 130 RNP Special Aircraft and Aircrew Authorization Required (SAAAR) approach procedures. RNP SAAAR approaches can provide an alternative means of access to runway ends that currently cannot support an Instrument Landing System (ILS). For example, at Palm Springs International Airport (PSP), the RNP SAAAR approach enabled increased access by reducing the ceiling and visibility requirements. Since this approach was implemented in 2005, Alaska Airlines has reported over 20 instances where they were able to land utilizing the RNP SAAAR approach to PSP rather than divert, cancel, or incur unnecessary delays. More importantly, during instrument weather conditions, airplanes flying to Palm Springs with RNP SAAAR capability no longer need to make a circuitous circling approach in mountainous terrain. Instead, aircraft fly a safer and shorter path to the runway.

Similarly, at Washington Ronald Reagan National Airport (DCA), RNP approach procedures have enabled aircraft to follow a precise path along the Potomac River, enabling aircraft operators who utilize this approach to more easily avoid prohibited airspace, while landing in low visibility condition to the South (see Figure 7).

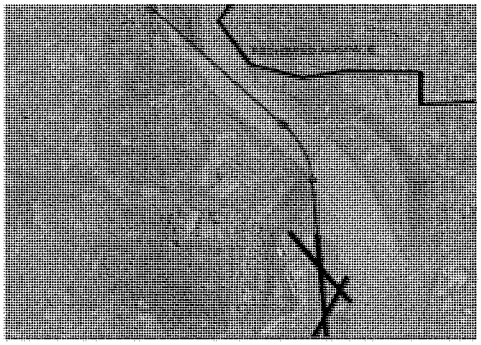


Figure 7: RNP SAAAR Procedure at DCA

RNAV and RNP procedures have been implemented across the country. Many of the major arrival/departure flows now have RNAV procedures. These procedures can result in greater savings through the use of more fuel-efficient profiles and flight paths that better address the capacity and throughput needs, and improve airport arrival and departure interactions. These interactions are, in part, responsible for many of the delays that occur today during daily operations at and near every major airport in the country. RNAV and RNP precision can provide the means to "untangle" these interactions for more-efficient operations and greater throughput for airports affected by this competition for airspace use. Taking this step means moving away from overlaying of these procedures along the historical traffic patterns and designing more efficient paths through the airspace.

Figure 8 below shows an example of one of these interactions that increases delays and sequencing requirements between O'Hare and Midway airports. MITRE has analyzed over 600 of these types of interactions across the country and is making recommendations to the FAA on ways to decouple these operations through use of PBN procedures. The challenges in

implementing non-overlay procedures include environmental requirements and airspace design complexities that often require a longer lead time.

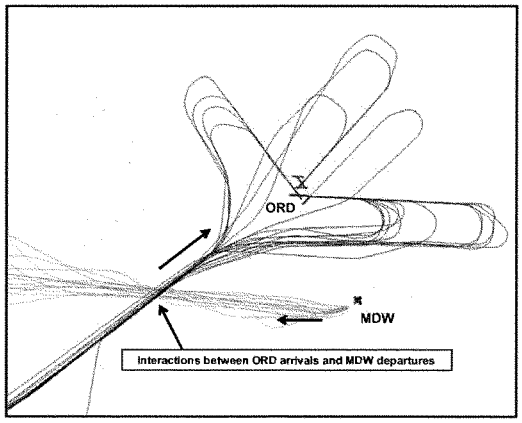


Figure 8: ORD and MDW Path Interactions

To enhance the smooth flow of traffic and realize greater benefits, we also need to better integrate these procedures across airports in a region. When procedures are integrated in a region, the entire airspace system is considered as a shared resource, where trade-offs are made between individual procedures to achieve the most efficient overall traffic flow. An integrated procedure design is expected to improve aircraft arrivals and departures, eliminate conflicting flows among nearby airports, and connect city pairs with new PBN routes for seamless and efficient paths.

The en route airspace faces similar challenges that can be addressed through the use of RNAV and RNP capabilities. RNAV and RNP enable the implementation of published routes in airspace where no ground-based navaids exist, such as over large bodies of water. Additionally, due to the precision inherent in PBN, additional routes can be placed for more efficient use of the airspace, thus increasing capacity and throughput. In October 2005, the FAA implemented the Florida Airspace Optimization (FAO), a series of airspace modifications including:

- New sectors in Washington Center (ZDC) and Miami Center (ZMA) to reduce and balance controller workload.

- New overwater routes to increase north/south capacity (See Figure 9).

- New RNAV and conventional arrivals to eliminate complex airspace merges into Fort Lauderdale (FLL), Miami International (MIA), West Palm Beach International (PBI) and other airports in south Florida (See Figure 10).

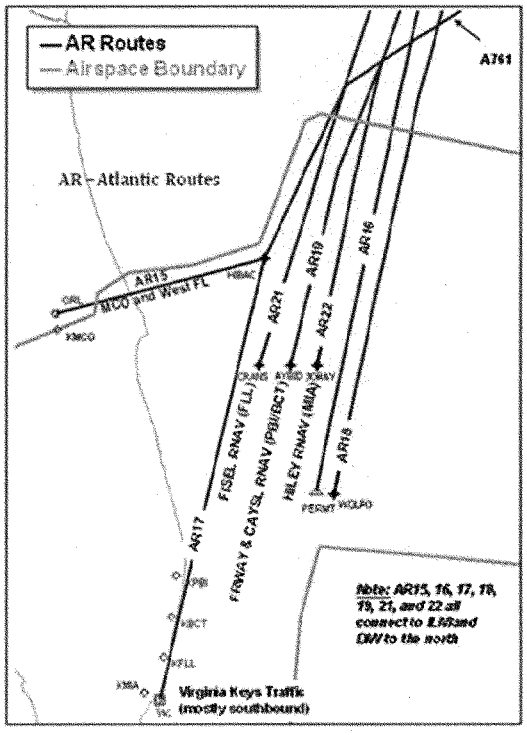


Figure 9: Florida Overwater RNAV Routes

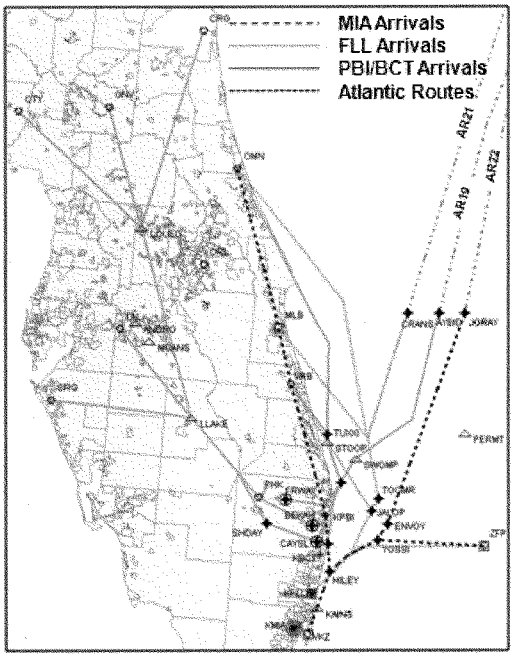


Figure 10: Florida RNAV Departure and Arrival Design

The new overwater procedures added five routes to the existing two. This was accomplished through the design of new RNAV routes that moved flights further east over the Atlantic, creating space for separate Miami, Fort Lauderdale, and West Palm Beach arrival flows. Two other routes also connected traffic to the Florida Keys and Orlando. New south Florida arrival procedures were also added to eliminate complex traffic sequencing and merging. The additional RNAV routes increased north-south flow capacity and efficiency, while providing the means to create direct connections to the RNAV arrival procedures into south Florida. According to MITRE post-implementation analysis of these procedures, airlines operating in this airspace have realized a cumulative savings of over $130 million since implementation in 2005 through 2008.

Optimized Profile Descents (OPDs)

Increased environmental awareness and rising jet fuel prices have stimulated the implementation of methods for reducing air transportation fuel consumption, pollutant emissions and noise, utilizing more advanced features of RNAV and RNP. Within the descent phase of flight, a strategy for reducing these impacts is to minimize the use of level offs. By maintaining idle or near-idle engines during descent, aircraft can minimize the fuel burned, the exhaust gases vented, and the noise generated by the engines. A general term for the broad class of descent routes and procedures which are designed to reduce fuel burn and emissions during descent is Optimized Profile Descents (OPDs).

Two major international partnerships and many independent research programs are currently underway to investigate methods for reducing fuel burn, emissions, and noise in air transportation. These partnerships involve trans-Atlantic and trans-Pacific flights, and include collaboration between industry, government, and academia. Spanning the Atlantic Ocean, the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) was formed with the goal to hasten the development of environmental improvements for all phases of flight. In the Pacific Ocean region, the Asia and South Pacific Initiative to Reduce Emissions (ASPIRE) was formed to extend that goal to flights in Asia and the South Pacific. As part of the initial milestones of the AIRE and ASPIRE programs, field trials of arrival flights utilizing OPDs have been completed, including trans-oceanic flights from Paris to Miami and from Auckland to San Francisco. These trials have demonstrated interoperability and validated the environmental benefits of optimized descents.

In addition to the trial flights of the international AIRE and ASPIRE partnerships, several domestic trial implementations of regularly scheduled flights have clarified the benefits and operational challenges of implementing optimized profile descents. Four such trials, which are notable for their scale, are the United Parcel Service (UPS) nighttime implementation at Louisville, and the arrivals implementations at Los Angeles, Atlanta, and Miami airports. For example, OPD flight trials in Atlanta and Miami airports during 2008 involved twenty flights. MITRE analysis of the data from these flights shows a fuel savings of 50 gallons per flight and a reduction in carbon emissions of approximately 450 kilograms per flight.

MITRE recently conducted a nation-wide analysis of arrival flows at over 100 airports to assess the potential application and benefits of OPD procedures. The analysis considered airports based on level of complexity for design and implementation, and the PBN capability of aircraft that use the airport. MITRE researchers found that OPD procedures can provide significant benefits in terms of reduced fuel consumption and emissions. Figure 11 depicts a sample list of those airports with less complex airspace structures and flows where OPDs can more easily be implemented in the near term. Figure 12 illustrates the range of benefits than can be achieved at those airports. The benefit range represented here is based on actual operational experience and analysis at the airports listed above along with other airports where OPDs are being flown today.

The study also found that the scale of benefits increases at larger airports with more complex airspace structures and flows such as Atlanta, Chicago, Los Angeles, and Philadelphia. For example, OPD implementation on arrival flows at Atlanta could yield benefits of $2.4 to $7.2 million per year in fuel savings. The latter fuel savings is the equivalent to removing 1,400 to 4000 cars from the roads every year. OPD procedure implementation at these more complex airports is likely to require longer lead time.

STL – St. Louis, MO
MHT – Manchester, NH
PIT – Pittsburgh,, PA
CVG – Convington, KY
RDU – Raleigh-Durham, NC
FLL – Fort Lauderdale, FL
PHX – Phoenix, AZ
MCO – Orlando, FL
SAN – San Diego, CA
SLC – Salt Lake City, UT

Figure 11: Selected Airports with Beneficial OPD Procedures

	Range of Fuel Savings: 5 to 15 Gallons Per Flight
Savings (Gallons/Year)	3 Million to 8 Million
Savings (Dollars/Year)	$8 Million to $24 Million
Carbon Reduction (Tons/Year)	27,000 to 80,000
Equivalent Cars off road (Cars /Year)	4,400 to 13,000

Figure 12: Estimated Benefits for Airports in Figure 11

Looking Ahead

Beyond the near-term, there are opportunities to combine different NextGen capabilities to achieve even greater benefits. By combining different NextGen capabilities we can conceptualize new applications and benefits, which cannot be achieved by the use of one capability alone. For example, concepts currently under development for approaches to closely parallel runways combines the use of ADS-B and RNP capabilities. The potential capacity benefit of this procedure is estimated to add approximately 15 to 22 arrivals at airports such as San Francisco, Los Angeles and Seattle. These airports during instrument meteorological conditions lose significant capacity by going to a single-runway operation.

In Summary

As I stated at the outset, the successful RNAV and RNP implementation over the past few years has resulted in significant benefits. As we move forward, we must consider implementation of those RNAV and RNP procedures that result in measurable benefits to the community – not just the number of procedures. Furthermore, we suggest a focus on implementing OPD procedures at airports with less complex airspace structures and flows, which can more easily be achieved in the near term. Recent trials and experience have demonstrated significant benefits, especially in terms of reduced carbon footprint. OPD procedure

implementation at airports with more complex airspace structures and flows should be undertaken as part of a more comprehensive airspace design, which is likely to require a longer lead time. The potential benefits of OPDs at these airports are likely to be even greater. Furthermore, RNAV and RNP procedures result in additional benefits as we consider more comprehensive airspace re-design, where these procedures don't follow the historical flight paths, but rather more-efficient paths through the airspace. I should hasten to add that the latter benefits are likely to be realized beyond the near-term due to significant lead times for addressing the environmental requirements for such comprehensive airspace re-designs. Streamlining the environmental process is likely to shorten the time to achieve these benefits. Finally, as we look ahead, RNAV and RNP, in combination with other capabilities such as ADS-B, data communications, enhanced ground automation capabilities and safe reduction in separation standards can result in even greater benefits.

Mr. Chairman, this concludes my testimony. I would be happy to answer any questions the Committee may have.

U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

July 31, 2009

Dr. Agam N. Sinha
Senior Vice President and General Manager
Center for Advanced Aviation System Development
The MITRE Corporation
7515 Colshire Drive, MS N642
McLean, Virginia 22102-7539

Dear Dr. Sinha:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry Costello

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
DR. AGAM N. SINHA
SENIOR VICE PRESIDENT AND GENERAL MANAGER
CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT
THE MITRE CORPORATION

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

CAASD
Center for Advanced Aviation System Development

Dr. Agam N. Sinha
Senior Vice President
and General Manager
7515 Colshire Drive
McLean, VA 22102-7539

703.983.6410
Fax: 703.983.6809
www.mitrecaasd.org

August 13, 2009
F010-L-261

The Honorable Jerry F. Costello
Chairman, Subcommittee on Aviation
U.S. House of Representatives
Committee on Transportation and Infrastructure
2251 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Costello:

Enclosed are my responses to the Questions for the Record submitted by Rep. Michael E. McMahon for the Subcommittee on Aviation hearing on July 29, 2009, regarding "NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)".

Please call me at 703-983-6410 if you have any questions regarding this response.

Sincerely,

Agam Sinha

Dr. Agam N. Sinha
Sr. Vice President and General Manager
Center for Advanced Aviation System
Development (CAASD)

ANS/cfv

Enclosure

MITRE

Questions for the Record

Dr. Agam N. Sinha
Sr. Vice President and General Manager
Center for Advanced Aviation System Development
The MITRE Corporation

July 29, 2009
Subcommittee on Aviation
Hearing on "NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)"

Question 1: I Commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

Response: We believe that a key strategy for a successful implementation of NextGen is to focus on delivering operational capabilities to achieve significant near and mid-term benefits. Emphasizing and reinforcing the strategy of an **integrated approach** to implementing NextGen is likely to improve the return on investment significantly. The **integrated approach** combines the use of technology with other important aspects such as airspace, procedures, ground and airborne automation systems, training, and environmental review requirements. This strategy points to a new way of managing the implementation of NextGen that is **"portfolio-based"** instead of program-based. The traditional program-based approach and associated program-by-program funding mechanisms focus program managers on implementing a system, but does not promote a holistic approach to delivering benefits. A **portfolio-based** implementation strategy considers all the necessary components that, when combined together appropriately and managed as a portfolio of programs, will result in a synchronized roll-out to achieve significant benefits – for example, a strategy that is not focused on quantity of RNAV/RNP procedures, but rather quality and benefits of its applications. Additionally, by combining different NextGen capabilities, the FAA can generate new applications and benefits. A good example of such a strategy is combining ADS-B and RNP capabilities. This combination has shown the potential to greatly increase capacity at multiple airports with closely spaced parallel runways. To the extent that Congress can provide legislative mechanisms to enable the FAA to employ such a portfolio-based implementation strategy for NextGen, the likelihood of successful delivery of benefits will significantly increase.

Below, we outline selected NextGen capabilities that, when implemented with all the necessary components (e.g., airspace, equipage, automation aids, training, etc.) are likely to provide significant benefits to our nation's air transportation system[1]:

[1] For a more expanded outline of these capabilities, please refer to Dr. Agam N. Sinha's response to the Questions for the Record (QFR), relating to his testimony before the House Committee on Transportation and Infrastructure, Subcommittee on Aviation Hearing on ATC Modernization and NextGen: Near-Term Achievable Goals, March 18, 2009.

- Data Communications capability will provide **nation-wide benefits** and will help relieve congested or constrained en route airspace by increasing ATC automation system effectiveness and decreasing air traffic controller workload.

- RNP with curved path capability will provide benefits in **congested, multi-airport metropolitan areas**. Increasing the number of aircraft with this capability would allow airspace to be redesigned to remove conflicts between arrival and departure flows for multiple airports in dense metropolitan areas.

- ADS-B "out" capability will provide **localized avionics-driven capacity benefits in non-radar airspace.** This allows equipped aircraft to be separated by as little as 5 nautical miles rather than being procedurally separated.

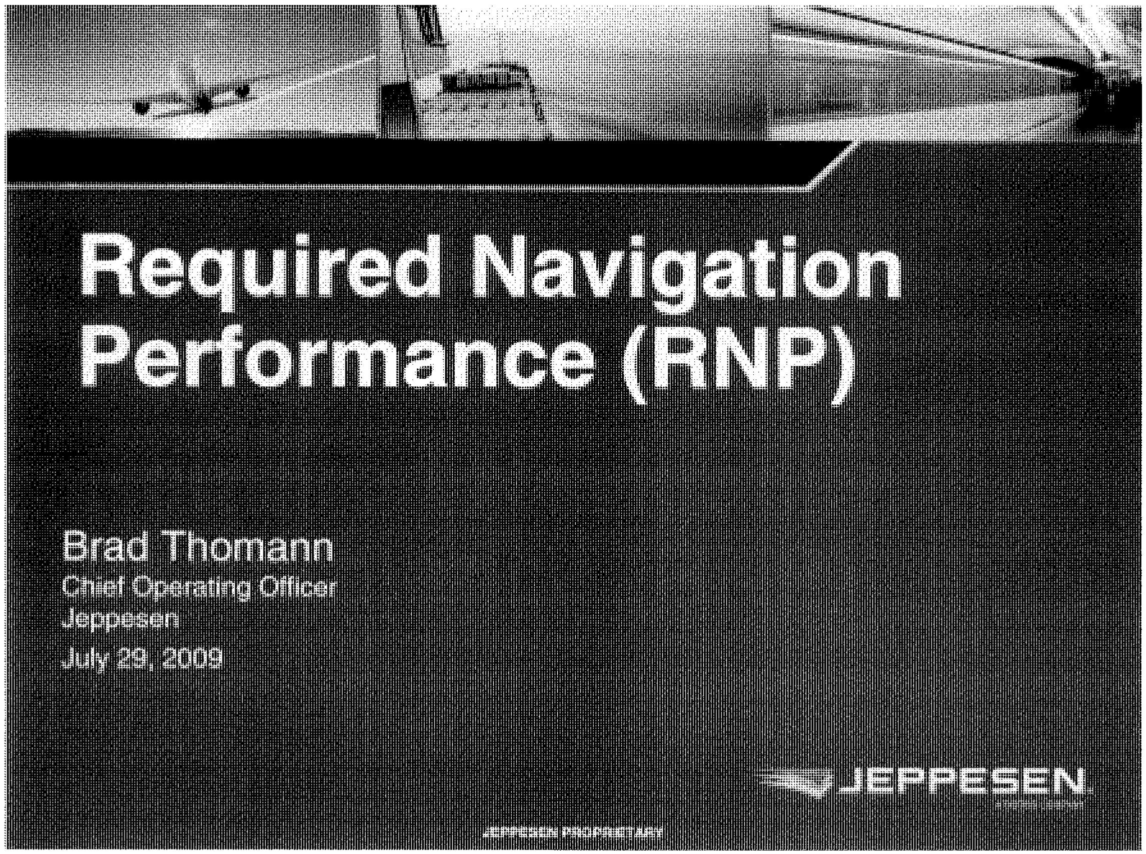
- ADS-B "in" capability will **provide localized safety and capacity benefits** in combination with ground and airborne systems. An example is improvements to runway safety through enhanced flight crew situational awareness while taxiing.

Question 2: In your view, are we adequately funding all aspects of the NextGen initiatives?

Response: We believe that an important area where Congress may be able to help expedite NextGen implementation is through incentivization of equipage for the existing fleet and, therefore, accelerate realization of NextGen benefits. While some specific segments of the operators are making investments in their fleet, wide-spread retrofit of the fleet is likely to occur at a slow rate over the next two decades. Furthermore, given the state of the overall economy of our nation and, in particular, the state of the airline industry, it is not likely that the majority of the airlines will be able to make the business case for equipage. Avionics is a critical component of the NextGen portfolio, and to the extent Congress can influence a more rapid rate of equipage, the faster the benefits to the National Airspace System are likely to be realized.

In addition, we would like to point to three important areas we believe could use additional attention. The first area is **cyber security,** as related to the protection of aviation and air traffic control operational data. This area is emerging as a critical part of NextGen, as our Nation's air traffic control system transitions from a "hard-wired" point-to-point communications architecture towards a distributed information network. As a result of increased information-sharing coupled with more numerous and sophisticated cyber attacks, the risks associated with these attacks are likely to increase and, if not addressed appropriately, could threaten the integrity of our air traffic control system. The second area where additional focus will prove beneficial is enabling routine **Unmanned Aircraft Systems (UAS)** operations in civil airspace. As the missions of the Department of Defense, Department of Homeland Security and other federal, state and local agencies evolve to include an expanding role for UAS, safely operating these systems in civil airspace on a more routine basis requires the resolution of key technical and procedural challenges. There is also a host of emerging private commercial applications for UAS, especially small aircraft. Additional resources would enable the FAA to develop and analyze the technologies, standards, procedures, regulations, and policies associated with routine UAS operations in the mid and far-term while continuing to address near-term requests for Certificates of Authorization or Waiver for public aircraft. The third area is

airspace re-design and procedures. Accelerating these development activities may require more resources for design activities, environmental assessments, flight validation, and training. For example, as the FAA embarks on more comprehensive airspace re-design efforts, the resource requirements associated with environmental assessment requirements are likely to increase. Adequate resourcing of such activities is critical to the successful implementation of an integrated NextGen portfolio of capabilities.


Required Navigation
Performance (RNP)
Brad Thomann
Chief Operating Officer
Jeppesen
July 29, 2009
JEPPESEN
JEPPESEN PROPRIETARY

Before the United State House of Representatives

Committee on Transportation and Infrastructure

Subcommittee on Aviation

Testimony of Brad Thomann

Sr. Vice President and Chief Operating Officer, Jeppesen

Hearing on NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)

July 29, 2009

About Jeppesen

Jeppesen has a rich history in aviation that goes back to Captain Elrey B. Jeppesen who designed and produced aeronautical charts that would become the industry standard. Jeppesen learned to fly in 1927 and earned his pilot's license, signed by Orville Wright. During the winters of 1930 and '31 when he was an airmail pilot, many of his fellow pilots perished because there was no published aeronautical information. This started him on a lifelong endeavor to improve the safety of air navigation by conducting aerial surveys, creating aeronautical charts and establishing the first flight procedures that pilots could use to navigate in poor visibility. He founded Jeppesen & Company in 1934 and, for the past 75 years, pilots and airlines around the world have depended on Jeppesen for timely, accurate, and thorough flight information.

Today, those initial paper chart products have evolved into a variety of digital navigation solutions for pilots and airlines. Jeppesen is unsurpassed in the aviation industry for providing products, services and training that meet current needs, and for developing technologies to meet future needs for all segments of aviation. In addition to its aviation leadership, Jeppesen also provides essential navigational and logistical products and services to sea and rail operations across the globe. Jeppesen is a subsidiary of Boeing Commercial Aviation Services, a unit of Boeing Commercial Airplanes.

Jeppesen has been analyzing airspace and designing all types of procedures for over nine years and RNP procedures for five years. This includes procedures delivered in 15 different countries around the world. Jeppesen's staff of highly trained and experienced personnel is fully capable of designing all types of procedures to both FAA (TERPS) and International Civil Aviation Organization (PANS-OPS) criteria. Recent accomplishments include the creation of 21 RNAV procedures at Beijing and 14 RNP procedures at Linzhi and Lijiang, China. As a third-party

service provider, Jeppesen offers a full suite of RNP-related services, including consulting for operators who wish to get approved for RNP, as well as RNP data validation and flight validation services. In addition, Jeppesen provides aeronautical charts and digital navigation data for on-board navigation equipment to meet the needs of all types of airspace users, from general aviation to the airlines. These chart and navigation data services are essential to efficient, effective use of RNP. U.S. airlines and other airspace users rely heavily on Jeppesen for their navigation solutions, as do operators in countries around the world.

What is RNP?

For decades, flight procedures have been built around ground-based navigation aids (navaids) which have limited flexibility and are expensive to install and maintain. Using ground-based navaids, aircraft are forced to fly from one specific fixed location to another specific fixed location. With the advent of satellite-based navigation, a new type of flexibility was introduced, and procedures are now developed using "points in space" rather than being tied to ground-based navaids. Area Navigation (RNAV) and Required Navigation Performance (RNP) take advantage of this satellite-based technology.

The significance of RNAV is that it enables aircraft to fly on any desired flight path within the coverage of ground- or space-based navigation aids. This provides the freedom to fly more efficient routes between airports as well as more efficient approach paths at the airport.

RNP is RNAV with the addition of an onboard navigational performance monitoring and alerting capability. The defining characteristic of RNP is the ability of the aircraft system to monitor the navigation performance and inform the flight crew whenever the specified navigational accuracy requirement is not met during an operation.

Importance of RNP

The increased level of precision offered by RNP plus its ability to use constant radius curved flight paths provides flexibility in procedure design that can result in a variety of benefits. For example, it is green. RNP enables shorter routes, which reduces fuel usage and emissions, while driving down operating costs. It enables increased airport capacity, helping to mitigate congestion and delays while respecting the noise footprint of the surrounding communities. At some airports, it allows aircraft to land in lower visibility, enhancing the operational reliability for the operator. It also allows for avoidance of specified areas for national security or noise abatement, precise navigation through challenging terrain, and lower approach minimums which reduce diversions in poor weather.

Due to the higher levels of navigational accuracy that RNP brings, ATC separation standards can be adjusted to allow aircraft to fly closer to each other, which can increase capacity without sacrifice of current safety levels and requirements. RNP also brings higher levels of repeatability of flown flight path to the flight operation within the terminal airspace. Workloads on ATC controllers may be reduced due to less radar vectoring and predictable flight paths, resulting in fewer radio transmissions. Another benefit of RNP is the ability to use curved flight paths, which allow precision navigation in situations where the traditional straight flight paths cannot be used. These curved paths are important elements in serving airports which are located in challenging terrain, because they decrease the controlled flight into terrain probability. The use

of curved flight paths is also advantageous to airports which have complex noise abatement requirements or which require very flexible navigation paths to avoid areas where there are flight restrictions such as in the area of the White House.

With the United States currently in the process of transforming its National Airspace System to meet the challenges of the 21st century through NextGen, there must be a fundamental change in philosophy by moving away from legacy ground-based navigation systems to performance-based navigation. In this new system, operators will navigate through our Nation's airspace according to pre-determined performance criteria rather than being rigidly held to specific avionics equipment. RNP is an important foundational element of this concept.

Even before NextGen capabilities are fully in place, RNP is a very attractive means of navigation for airspace users due to all the benefits mentioned earlier. While airlines led the way with RNP, business and general aviation are increasingly interested in utilizing the performance capabilities as well.

Current Status

To date, the FAA has provided roughly 140 RNP procedures at 42 airports around the United States. Airspace users feel that some of these procedures do not provide the desired operational benefits, such as reductions in flight time, increases in capacity or lower approach minimums. Even if a selected procedure offers benefits in one or more of these areas, the usability of the procedure may be affected by aircraft, aircrew or air traffic control readiness at that location. Airspace users are calling for a substantial increase in introduction of new RNP procedures at locations which offer specific operational benefits, and where aircraft, aircrew and ATC are in a position to take advantage of these procedures.

To meet airspace user requirements for increased levels of capacity, efficiency, and safety the FAA will need to do several things to accelerate RNP implementation.

First, the FAA needs to make the commitment to move forward with RNP as the primary means of operations for the NAS and develop an aggressive implementation plan for RNP in all phases of flight. While RNP is recognized as a foundational element of NextGen, the transition plan to achieve this has not been adequately focused and resourced to accomplish the necessary safety assessments and operational implementation designs (For example, determining the adequate spacing between RNP tracks and allowing RNP approaches to be established on lateral approach tracks). Without this work on operational approvals, we will be unable to move beyond procedures that simply overlay today's flight paths or provide separation from terrain and fail to achieve the full potential of RNP.

Second, the FAA will need to supplement its capacity to develop procedures. This can be done through use of carefully selected and approved procedure design suppliers who can help fulfill this need. The FAA's program for 3rd Party RNP Other Transactional Authority (OTA) was designed for this purpose and ensures that only highly qualified companies can help with RNP procedure design. Jeppesen has consistently demonstrated to the FAA all of the necessary requirements for OTA certification, including our strong ATC experience, which helps ensure acceptance of procedures by air traffic controllers. Jeppesen and other like third-party providers

can successfully complement the work that the FAA does in RNP procedure design by providing shorter to-market time for RNP procedures, allowing customers to reap the benefits of RNP more quickly and to meet the needs of NextGen.

Procedure Maintenance

The FAA has a long history of managing both procedure design and ongoing maintenance of those procedures. Currently FAA averages around 500 to 600 new or revised procedures per 56-day cycle. Ongoing surveillance and maintenance requires scrutiny of a variety of factors that can result in a procedure revision. This is a very large and complex task. The FAA has developed a core competency for this. While the OTA specifies that the private provider will conduct this ongoing maintenance, Jeppesen feels that task should reside with the FAA so there is a single source of knowledge about every public procedure in the national airspace system. This would allow a balance between the government role and that of private industry. In many countries around the world, the aviation authorities and air navigation service providers (ANSPs) contract with external companies for initial procedure design, then bring the ongoing surveillance and maintenance of those procedures inside, under the responsibility of the aviation authority or ANSP. Jeppesen feels the FAA should consider this model. The OTA third-party RNP authorization could help them select well-qualified companies for creation of the initial procedures, helping the FAA to increase capacity as needed.

Summary

RNP is an important element of NextGen. It provides flexibility in procedure design that enables shorter routes, increased capacity, precise navigation through challenging terrain and fewer diversions in poor weather. It can help to increase capacity, bring higher levels of repeatability of flown flight paths and reduce ATC workloads. It allows the use of curved flight paths, which is important for airports located in challenging terrain that have complex noise abatement requirements or are in areas with significant flight restrictions.

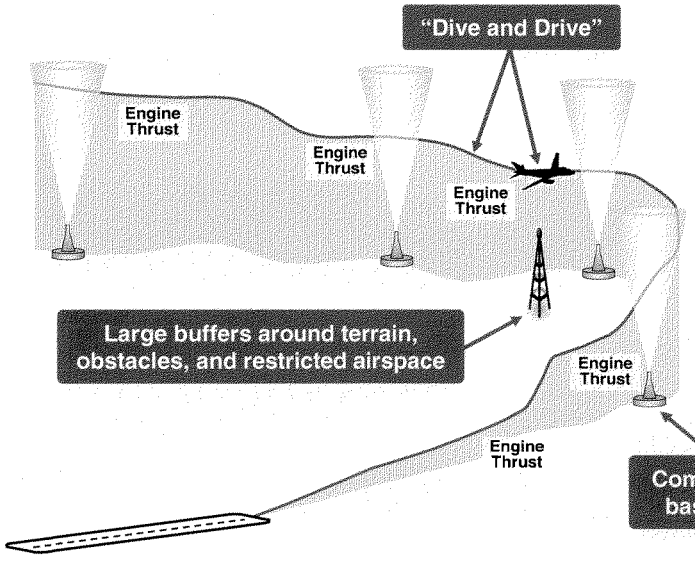
Currently, airspace users feel that the FAA is not publishing enough new RNP procedures to meet requirements for increased levels of efficiency. To meet these requirements, the FAA will need to enhance its implementation efforts to gain approval of advanced RNP operations and supplement its procedure development capacity by using highly qualified procedure design suppliers. The FAA has a system in place to allow these suppliers to increase the availability of RNP procedures. Once the procedures are established, the FAA should retain ongoing surveillance and maintenance of the procedures, since it has a core competency in this discipline. This will provide one knowledge source for every public procedure.

By implementing these suggestions, the FAA can increase the capacity, efficiency and safety of NAS operations..

What is RNP?

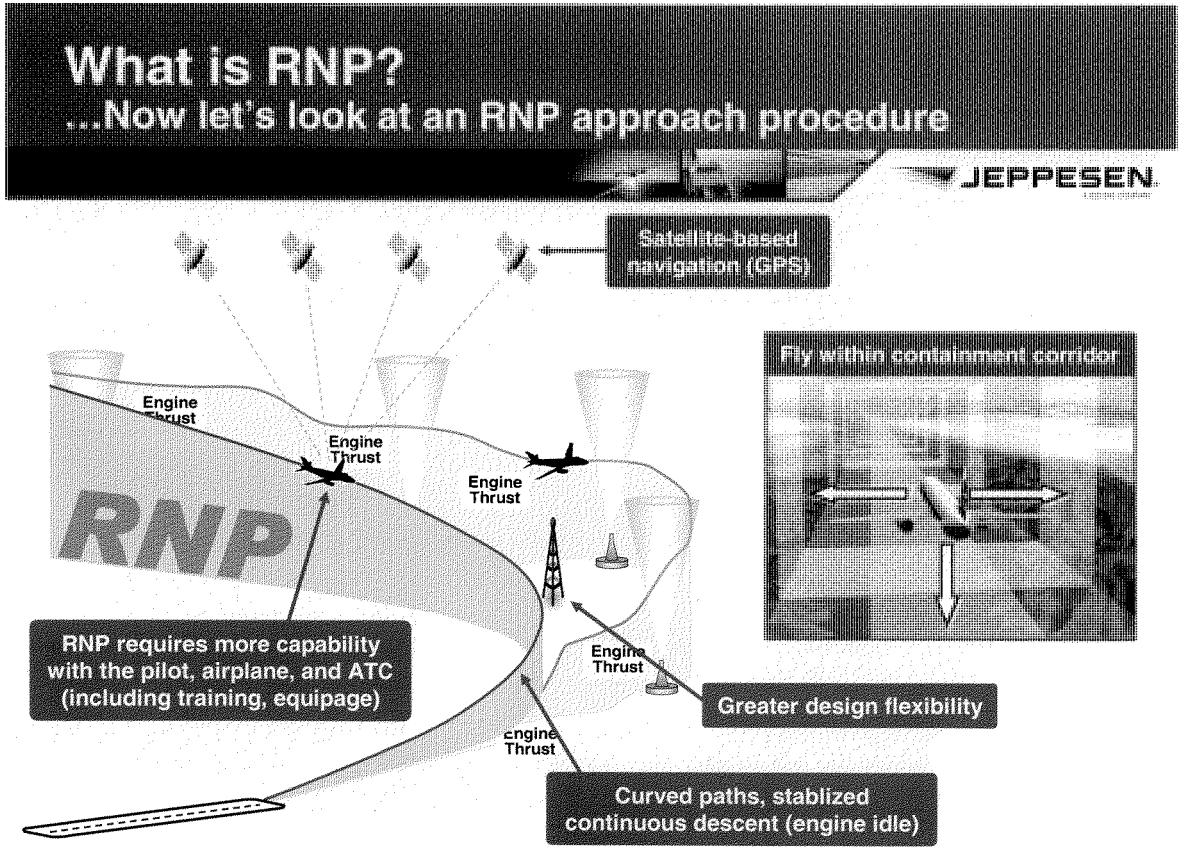
First, let's look at a traditional approach to an airport...

JEPPESEN



The vast majority of instrument approaches in the world today are flown according to this design philosophy.

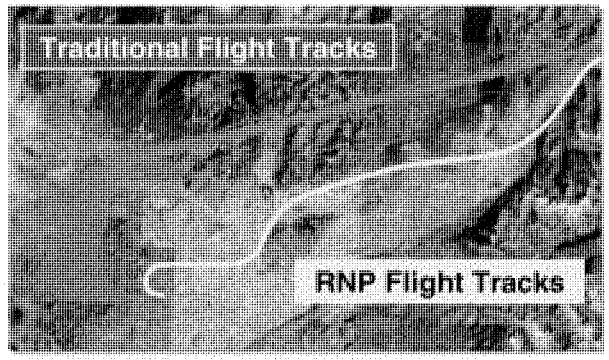
This is well-established and very safe, but is near its maximum capability in terms of efficiency, carbon emissions, and capacity.


What is RNP?
...Now let's look at an RNP approach procedure
JEPPESEN
Satellite-based navigation (GPS)
Fly within containment corridor
Engine Thrust
Engine Thrust
Engine Thrust
RNP
RNP requires more capability with the pilot, airplane, and ATC (including training, equipage)
Engine Thrust
Greater design flexibility
Engine Thrust
Curved paths, stablized continuous descent (engine idle)

Some RNP Benefits

JEPPESEN

- **Safety**
  - Stabile approaches
  - Protection in engine-out emergencies
  - Operational consistency
  - Reduced risk of controlled flight into terrain
- **Environment & Capacity**
  - Emissions reductions
  - Noise reductions
  - More air traffic/airport capacity
- **Financial**
  - Fuel savings
  - Aircraft utilization
  - Reduced engine wear
  - Cap & Trade



Next GEN –
Serving the Needs of the 21st Century

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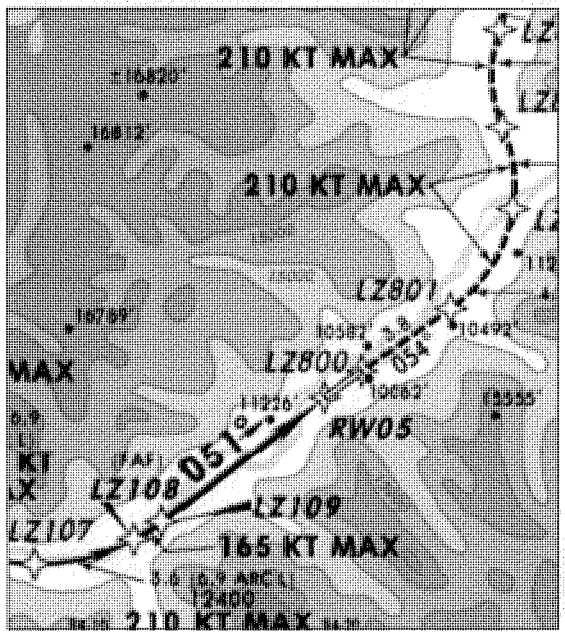

U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
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John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

July 31, 2009

Mr. Brad Thomann
Senior Vice President and Chief Operating Officer
JEPPESEN, A Boeing Company
55 Iverness Drive East
Englewood, Colorado 80112

Dear Mr. Thomann:

On July 29, 2009, the Subcommittee on Aviation held a hearing on **"NextGen: Area Navigation (RNAV)/Required Navigation Performance (RNP)."**

Attached are questions to answer for the record submitted by Rep. Michael E. McMahon. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

JFC:pk
Attachment

JULY 29, 2009
SUBCOMMITTEE ON AVIATION
HEARING ON
"NEXTGEN: AREA NAVIGATION (RNAV)/REQUIRED
NAVIGATION PERFORMANCE (RNP)"

QUESTIONS FOR THE RECORD
TO:
MR. BRAD THOMANN
SENIOR VICE PRESIDENT AND CHIEF OPERATING OFFICER
JEPPESEN, A BOEING COMPANY

1. I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?

2. In your view, are we adequately funding all aspects of the NextGen initiatives?

Before the United State House of Representatives
Committee on Transportation and Infrastructure
Subcommittee on Aviation

Response of Brad Thomann
Sr. Vice President and Chief Operating Officer, Jeppesen
To Questions for the Record
Submitted by Rep. Michael McMahon
August 13, 2009

1. **I commend all the important planning for NextGen – but do you have specific suggestions for actions we in Congress can take to expedite or otherwise improve the implementation of NextGen?**

   RNP:
   - First, the FAA needs to make the commitment to move forward with RNP as the primary means of operations for the NAS and develop an aggressive implementation plan for RNP in all phases of flight. Initiation of a series of joint government/industry projects to address the operational implementation issues would accelerate and expand the use of RNP.

   - Second, the FAA will need to supplement its capacity to develop procedures. This can be done through use of carefully selected and approved procedure design suppliers who can help fulfill this need.

   NextGen:
   - To accelerate NextGen overall the FAA needs to establish and empower an organization that clearly defines the budget, schedule, project organization, leadership and the specific transition/implementation steps planned to make NextGen a reality. Performance metrics that measure outcome (capacity, efficiency, etc) would help Congress and industry track the progress of NextGen.

   - Acceleration of key near-term projects could jumpstart the implementation of NextGen. These projects, which include Tailored Arrivals, RNP, GLS, and SWIM/NEO, could be implemented quickly for minimal investment. All of these projects have been tested and are providing benefit to users, but need to be expanded nation-wide.

In your view, are we adequately funding all aspects of the NextGen initiatives?

Many key NextGen initiatives are underfunded. Additional funding and focus is needed not only for implementation of technologies but also the operational changes to enable the benefits from these initiatives.
A few examples of projects that need additional funding: